

## THE MEADOWLANDS METHOD: AN EXPERIMENT IN AN INTEGRATED CURATIVE SERVICE

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The Transvaal Provincial Administration, faced with increasing hospital costs and continual demands for additional hospital beds involving considerable capital expenditure, decided to establish a combined clinic and district-nursing service. The initial experiment was carried out at Meadowlands, Johannesburg, where a clinic was opened in September 1957 under the control of Baragwanath Hospital.

*Meadowlands—Demography and Environment*

The residents of Meadowlands were moved from slum areas to this modern location, where all the amenities of a well-designed township have been provided. Hygiene and sanitation are of the highest order. Roads have been built, schools established, and provision made for a social centre. The population, which consists entirely of Natives, is at present (March 1959) 50,000. Building expansion is rapid and the population increase is about 1,000 per month. Eventually about 80,000 Natives will be accommodated in this area. Defined zones have been established for the main ethnic groups—Sotho, Nguni, Shangaan and Venda. Each zone is under the control of a superintendent with an administrative staff.

*The Clinic Buildings—Design and Planning*

After considerable research into the population needs and the type of service required, the National Building Research Institute provided the plans for the clinic buildings. A full description is given by Zwart.<sup>1</sup> The most notable innovation in design is the adoption of the principle of 'patient flow', which has prevented congestion in the clinic. The large central waiting hall of the older type of clinic has been abolished and several smaller waiting areas adjacent to each consulting room have been provided. The building occupies 12,000 square feet and has been erected at a cost of 18s. per square foot.

*The Clinic as an Integral Part of a Comprehensive Medical Service*

Unification of all health services under a single authority would be difficult to attain because of legislation which has divided the responsibility for different aspects of disease control among the central, provincial and local authorities, in addition to many voluntary organizations. The problem is a complex one, but a great step forward has been taken in the unification of curative services, as exemplified in the Meadowlands experiment, where the clinic and Baragwanath Hospital operate under the same Provincial control.

To illustrate the present organization: Patients attend the clinic for every type of ailment, yet we have no authority to treat cases of tuberculosis and infectious diseases, e.g. diphtheria. Immunizations are performed by the local authority

(Peri-urban Areas Health Board) and vaccinations by the Union Health Department. Welfare administration is carried out by the Native Affairs Department and voluntary organizations are concerned with child feeding and related aspects of child care.

This division is administrative and financial, but at patient level there is no reason why complete amalgamation of all these services should not be effected. This has in fact been done at Meadowlands with most satisfactory results. For instance, there is complete liaison in regard to tuberculosis control; the local authority's staff attend the clinic every week for discussions on the cases referred by the clinic. The Union Health Department carried out a vaccination campaign with their staff operating from the clinic premises. A voluntary organization supplies food to the needy from the clinic every day. Welfare measures are instituted on the advice of the clinic personnel. In fact for all practical aspects a complete coordinated medical service operates at Meadowlands Clinic.

*The Clinic in Relation to the Hospital*

As already mentioned, the first step in coordination has been a unification of curative service by the linking of Meadowlands Clinic with Baragwanath Hospital. To extend hospital therapy to the home a district nursing service has been organized. It is thus possible to discharge patients from hospital at a much earlier date with the assurance that they will be under clinic surveillance. By this shortening of the stay in hospital bed, congestion is relieved. In addition a midwifery service has been organized. At present Baragwanath Hospital accepts all confinements, which results both in a shortage of beds and a curtailment of the period of hospitalization of maternity patients. Gradually the clinic will take over the normal cases and the hospital will be free to concentrate on abnormal cases really requiring hospitalization. To facilitate night deliveries 6-7 beds will be provided at the clinic for this purpose.

Many obvious advantages have resulted from the coordination of the curative services. X-ray and laboratory facilities have been made readily available to the clinic. The long-term follow-up methods of the clinic enable studies of disease to be made in the patient's natural environment, and the data obtained are readily available to the hospital personnel. The specialists at the hospital advise on difficult cases and when necessary visit the clinic for consultations. For instance, at Meadowlands we are perturbed by the high incidence of otitis media and hypertension, and in order to study these conditions the hospital staff visit the clinic. This has the added advantage of bringing the clinic personnel into touch with advances in medical progress.

### Meadowlands—The Effect on Hospital Admissions and Attendances

The usual monthly in-patient admission rate to hospital is assessed at 5 per 1000 of the population. The monthly number of patients admitted to Baragwanath Hospital from the Meadowlands Clinic has never exceeded 1 per 1000 of the Meadowlands population and has even dropped to 1 per 2000. The inclusion of the patients who short-circuit the clinic and proceed direct to the hospital does not increase the monthly admission rate beyond 1·2 per 1000.

There has also been a marked decrease in the Meadowlands out-patient attendances at Baragwanath. The following is an analysis of 5,000 consecutive attendances at the paediatric out-patient department at Baragwanath Hospital.

Area	Attendances per 1,000 population
Meadowlands	1·8
Area A	7·0
Area B	6·0
Area C	13·0
Area D	14·0
Area E	15·0
Area F	15·2
Area G	23·4
Area H	50·1

In these areas, except A, E and C, a child-welfare clinic service is in operation and within easy reach of the residents. The living conditions in all the areas is similar, except in area H, where very poor conditions prevail.

### Costs

The cost (in shillings) per patient treated at Meadowlands Clinic over a 3-month period is as follows:

Direct costs	5·68	5·13	5·03
Indirect costs	2·21	1·88	2·04
Total	7·89	7·01	7·07

The approximate attendances over a year for a population of 50,000 would be 100,000, at an annual cost of £35,000.

These unit costs, which include the provision of district-midwifery and home-nursing services, are less than the unit costs of a hospital casualty department.

### Clinic Practice

The limiting factor for efficiency in clinic practice where large numbers of patients attend for treatment is the time available for the adequate investigation of the individual patient's complaint.

Under pressure, clinic practice sometimes deteriorates to little more than treatment of symptoms and reference of all doubtful cases to hospital. A medical officer employed in such an institution soon loses his skill for the careful assessment of clinical findings, and the patient, who often has to wait a long time for attention, is dissatisfied by the cursory nature of the examination and the general lack of attention given to his complaints. Such practice cannot produce any permanent benefit to health, and it fills the hospitals with relegated cases and thus increases the costs of health administration. The approach is in the best interests neither of the doctor nor of the patient. Unfortunately, because of pressure of work and inadequate staffing, the term 'clinic' has become associated with this form of medical practice. The time has surely arrived for a more positive attitude to the problems of

ill-health in the individual and the community. The organization of the Health Centres was a progressive step in this direction, but in these institutions the emphasis was placed on promotive and preventive medicine, whereas the high incidence of disease in Native areas made it imperative that the first function should be disease control at the curative level and that promotive-preventive measures, while not neglected, should remain subsidiary to curative medicine.

In Meadowlands the positive nature of the curative work has been realized and, in order to emphasize this, the Meadowlands method aims at *health recovery* and it has been suggested that the term 'clinic' should be changed to 'health recovery centre'.

### Basic Concepts of Health Recovery

Under prevailing conditions in a clinic, disease for the most part is regarded as episodic—a host reaction, often limited to part of the body and due to certain causality in a specific time interval. The approach to 'health recovery' is fundamentally different. It must imply 2 main concepts:

1. An assessment of the whole individual extended, under certain circumstances, to the family and the community.

2. The dynamic nature of pathology—the continual progression and retrogression of such processes due to direct and indirect causality, environment, psychosomatic host reaction, and the changes induced by therapy. The pathology is either self-limiting or extended. In the former case the time interval is limited; in the latter it is prolonged until a degree of recovery has been reached or until the methods have failed and the patient has succumbed to the disease.

### THE PRINCIPLES AND ORGANIZATION OF THE MEADOWLANDS METHOD

#### Principles

Based on the above concepts there are 4 main principles of practice:

#### 1. Prevention of Disease at the Level of Early Diagnosis

Separate institutions established for the early detection of such diseases as tuberculosis and cancer cause division of health services which is not in the best interest of the patient. The miniature X-ray is an example. It is employed solely for the purpose of finding early cases of tuberculosis, and other chest conditions are excluded because the authority is concerned only with tuberculosis. In Meadowlands, where the whole population is being X-rayed, we are obtaining reports on all abnormalities seen on the plates; several cases of cardiomegaly which would have remained undetected are now being investigated.

The antenatal examination, so universally accepted, is perhaps the best example of the importance of this principle, which should be extended to all fields of medical practice. Simple routine tests in conjunction with the clinical examination bring to light early diabetes, tuberculosis, syphilis, hypertension etc. Malnutrition in infants should be diagnosed not at the 'skeleton stage', but when weaning is commenced or when the mother begins work, an act associated with neglect of feeding and consequent malnutrition.

#### 2. Selection

Amongst all other cases seen there is a group designated 'special cases', which are priority cases that fall into 2 categories:

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diately be ascertained, and where, therefore, it is doubtful whether the pathology is self-limiting. Into this category would fall various symptom complexes such as cough, fever and loss of weight (possibly indicating tuberculosis), tumours—benign or malignant—obscure fevers, blood dyscrasias etc. Patients suffering from such complaints are 'listed' until the diagnosis is established.

(b) Certain categories of chronic cases, such as the following: Cardiovascular disease requiring prolonged therapy to prevent relapse. Children suffering from malnutrition and who require prolonged surveillance to maintain their nutrition. Any specially prevalent diseases are included in this group; otitis media is so rife in Meadowlands that about 200 cases have been 'listed' as special cases for prolonged surveillance and study.

This selection is not only of benefit to the patient, who is kept under continual control, but it is of great value in the study of disease to establish not only the present incidence, but also the changes from year to year and the influence of various therapies over a period of time.

### 3. Observation over a Period of Time

This principle bears a relation to the dynamic nature of pathology. It is part of the process of selection which will give an added impetus to research in Native medicine. At present, observations on patients are largely confined to a brief period of illness in a hospital. The ultimate prognosis of many cases is left in doubt and the true function of the patient cannot be adequately assessed unless he is observed in his own environment. What is the fate of the Native suffering from hypertension? What percentage of children suffering from otitis media will become deaf? Furthermore, the answer to a very pertinent question in this day and age can only be provided by this method of observation; viz. Will the increase of strontium-90 in the atmosphere cause a greater number of congenital deformities in future years?

### 4. Health Recovery

This implies the remedy of both direct and indirect aetiology, and the use of recognized therapeutic measures, ancillary services and welfare measures to correct as far as possible socio-economic factors. There are 3 types:

(a) Symptomatic—limited only to the relief of symptoms; e.g. advanced carcinoma.

(b) Partial—enabling the patient to enjoy a large measure of normal function; e.g. patients suffering from cardiac failure.

(c) Complete—the restoration of normal function.

### Organization

#### The Unit System

The Meadowlands area is divided into geographical units of 16,000 inhabitants. Each unit is controlled by 2 medical officers who are responsible for the organization of the clinic work, the 'special cases', the antenatal and midwifery services, and the district-nursing service, in the specific area. In Meadowlands the unit areas follow the pattern of the ethnic groups, a system which enables interesting comparisons to be made between races still living at different stages of civilization. These figures apply only to Meadowlands. The size of the unit would vary in accordance with the general-practitioner services and the incidence of disease in the community.

#### The Special Case

Each medical officer keeps 2 charts for the special cases—one for doubtful and acute cases, the other for chronic cases. The first chart is divided into columns for each day of a month, the second into weekly intervals over a whole year. A series of symbols on the date indicate whether the patients have attended the clinic or not, if a home visit has to be made, and if the nurses have reported the progress of the patient. The nursing staff keep a master-record of all the medical officers' charts on a large peg-board. After a time cases can be grouped into cohorts of various diseases such as malnutrition, cardiovascular disease, otitis media, toxæmias of pregnancy, etc.

In addition to the above, the clinical cards are filed in cohorts, firstly according to ethnic grouping and secondly according to age of birth. Thus one can observe the progress of a whole group born in one specific year over a whole lifetime, provided that the population remains relatively stable. The clinical cards are also marked with a series of symbolic tags indicating specific diseases. Thus, in a matter of minutes one could abstract all congenital deformities in each racial group for each year of the existence of the clinic.

#### Simplification of Clinical Examination

A card has been devised which is separated into 3 sections. The first section deals with basic information and routine tests e.g. name, age, sex etc., weight, blood tests, blood pressure and urine. The second section covers in broad outline the patients symptoms. These two sections are completed by the nursing staff; the medical officer checks the information and enquires further into the history of the patient. The third section, for the clinical examination, covers every system of the body. Abnormalities are not detailed but are marked in red against the system affected in order to establish a systemic diagnosis, e.g. cardiovascular disease. The detailed diagnosis is expanded on the clinical card proper—perhaps at a later date if time is not available at the first examination. Under the present staffing arrangements at Meadowlands it is not possible to carry out such an extensive examination on every patient. It is being tried in the over-40 age-group and in children, but later it will be extended to cover all age-groups.

This clinical examination forms the basis of 'prevention at the level of early diagnosis'. We have many interesting examples of the most trivial symptoms revealing gross pathology; e.g. gross hypertension revealed by quite unrelated symptoms.

The antenatal clinic is run on the usual lines and all abnormalities are listed as special cases. The Provincial authorities have wisely made this preventive function part of the curative (midwifery) service. However, there is a great hiatus in the service, in that prevention is not carried out 'at the level of early diagnosis' in Native children, from birth to the age of 15 months, where there is the highest morbidity and mortality. For this reason, every child born in the district is automatically made a special case for home visiting during this period. This most important and vital application of the first principle of the Meadowlands method is the best example of clinical prevention of disease. It is truly a function of the child-welfare department of the local authority, to which, when it is established, this aspect of our work will be handed over.

*The Home-Nursing Service in Relation to Social and Environmental Factors*

Unfortunately, Native clinic practice has deviated from the type of general practice in which the doctor not only understood the individual complaints, but had a complete understanding of the family. He was well described as the family doctor. With Native patients, apart from language differences, there are many difficulties in obtaining a clear insight into the family milieu, the complicated psychological reactions of the Native to disease, and the influence of age-old customs and beliefs. Medical practice cannot fulfil itself if it neglects these aspects and, for this reason, an important function of the Native nurse, understanding the problems of her own race, is to supply the necessary information to the medical officer. Regular discussions are held, and appropriate action can be taken either through education or economically, the latter by application to the welfare authorities for grants and relief from rents in circumstances of misfortune.

For the most part, general home nursing is carried out, that is to say where it is not necessary for the patient to occupy a hospital bed and where the home conditions are satisfactory for the care of the patient. This needs no further elaboration. Where, however, socio-economic, nutritional and environmental factors present problems, and where it is no longer a question of the individual, but of the whole family, the doctor-nurse liaison is maintained, both by the

discussions mentioned above and by records on a special card on which all the necessary information is recorded.

#### CONCLUSION

This article describes an integrated clinic-hospital service where all related aspects of a complete health service are taken into consideration, but with the emphasis on curative medicine. The Meadowlands area is only a small part of a vast Native district of half a million residents. New clinics are being planned to provide a more comprehensive service for this population. Greater expansion can be envisaged for the promotive and preventive functions which will be under the control of the Johannesburg City Council. Preliminary discussions have indicated a unanimity of views in regard to the closest cooperation in all aspects of health administration.

It is felt that the form of practice devised at Meadowlands offers a much widened scope for the medical officers working in this institution. Under these better conditions and with the hospital liaison it is hoped that many newly qualified medical practitioners will join this service.

My thanks are due to Dr. I. Frack, Medical Superintendent, Baragwanath Hospital, for his cooperation and permission to publish this article.

#### REFERENCE

1. Zwart, W. (1959): *The Design of Polyclinics and their Effect on Medical Services in Bantu Urban Areas*. Pretoria: National Building Research Institute.

## THE BACTERIOLOGY OF THE BANTU FOOD-HANDLER: ENTEROBACTERIACEAE

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Recent surveys on salmonellosis and shigellosis in South Africa<sup>1,2</sup> show that our knowledge of the subjects is very incomplete. For instance, the reservoirs of infections have received little attention,<sup>2</sup> but it is often thought that the apparently healthy Bantu food-handler may be a carrier and thus spread the diseases. This is exemplified in the prophylactic measures adopted for the prevention of typhoid fever. For many years it has been the practice to test prospective or employed food-handlers for circulating Vi-agglutinins and to examine their excreta for the presence of *Salmonella typhi*. The doubtful value of indiscriminate Vi-testing has been dealt with in another communication.<sup>12</sup> Cultural examination is open to many pitfalls but, to the best of our knowledge, nothing has been published in South Africa about the possible errors involved or, as regards food-handlers, the value of the results obtained. It would be of interest to know the frequency of salmonellae and of shigellae in faeces and urine, as well as the smallest number of specimens that must be examined before the subject is declared free of these organisms. Furthermore, in case of positive findings, the type of organism causing the infection must be stated, and attempts should be made to determine whether the people concerned are chronic carriers or merely short-time infected individuals with subclinical symptoms. As regards chronic carriers, it is worth considering whether it is necessary to adopt the same prophylactic precautions irrespective of the type of organism recovered; although it is essential to bar a typhoid carrier from the food trade it

does not follow that the same applies if he is a carrier of, say, *S. johannesburg*.

Despite the many unknown factors involved, the present system of prophylactic investigation is often regarded as satisfactory. Some workers doubt its value but adopt it on the plea that no better method is available. It appears, therefore, that a careful examination of the problem is necessary in order to determine whether the method is bacteriologically and economically sound.

**Material and Methods.** The information was obtained from the 1958 files of the South African Institute for Medical Research, which dealt with the bacteriological investigation of faeces and urine from prospective or employed Bantu food-handlers attached to the mining industry in the Transvaal. The conditions under which the specimens were obtained, and particularly whether purgatives were used,<sup>3</sup> are unknown. The excreta, usually submitted without transport media, were examined for salmonellae and shigellae although in the majority of cases only *S. typhi* investigation was requested. The specimens were planted on SS- and McConkey plates, and a selenite enrichment medium. The biochemical characteristics of the isolated colonies were examined in composite media and the cultures conforming to the pattern of salmonellae or shigellae were investigated serologically. The salmonellae were typed but the shigellae were classified only by their major antigen.

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## RESULTS

In 1958, 2,778 specimens of excreta were examined from 1,565 Bantu food-handlers (Table I). It appears to be common practice to search for enteric pathogens in both urine and faeces, but in almost a quarter of the cases only one specimen

TABLE I. ORIGIN OF SPECIMENS

	Food-handlers		Specimens	
	Number	Percentage	Faeces	Urine
One specimen of faeces only ..	244	15.6	244	—
One specimen of urine only ..	137	8.8	—	137
One specimen of faeces and one of urine ..	1,166	74.5	1,166	1,166
Faeces and urine, 3 or more specimens ..	18	1.2	40	25
Total ..	1,565		1,450	1,328

was submitted, and then faeces (15.6%) more often than urine (8.8%). The choice of specimens was a peculiarity of the individual mines, some always submitting faeces and urine, others faeces only or urine only. On an average 1.8 specimens were received per individual. Among these was an occasional follow-up specimen received from those found to harbour pathogenic organisms.

Table II shows that from 75 (4.8%) of the individuals either salmonellae (67 cases) or shigellae (9 cases) were

TABLE II. RECOVERY OF SALMONELLA AND SHIGELLA ORGANISMS

	Food-handlers		Specimens of Faeces		Specimens of Urine	
	Number	Percentage	Number	Percentage	Number	Percentage
Salmonellae ..	67	4.3	68	4.7	0	—
Shigellae ..	9	0.6	8	0.6	1	0.08
Total ..	75	4.8	76	5.2	1	0.08

isolated. One of the food-handlers was infected with *S. albuquerquense* and *S. montevideo* and another with *S. albuquerquense* and *Sh. sonnei*. Of the faecal specimens 76 (5.2%) were infected, as against a negligible percentage of the urine samples. The recovered salmonellae were of 25 different types. Their distribution according to the Kauffmann-White scheme<sup>3</sup> is set out in Table III. In order of frequency, *S.*

TABLE III. THE SALMONELLA TYPES GROUPED ACCORDING TO THE KAUFFMANN-WHITE SCHEME<sup>3</sup>

Groups and Types	No.	Groups and Types	No.
Group B		Group E1	
<i>S. typhi</i> murium	2	<i>S. anatum</i>	9
<i>S. paratyphi</i> B	2	<i>S. london</i>	2
<i>S. saint-paul</i>	1	<i>S. newlands</i>	1
<i>S. abortus bovis</i>	7		12 (17.7%)
<i>S. wagenia</i>	2	Group F	
<i>S. chester</i>	5	<i>S. aberdeen</i>	2 (2.9%)
<i>S. san diego</i>	1	Group G	
	20 (29.4%)	<i>S. poona</i>	1 (1.5%)
Group C1		Group H	
<i>S. montevideo</i>	8	<i>S. albuquerquense</i>	2 (2.9%)
<i>S. thompson</i>	1	Group N	
Group C2		<i>S. london</i>	1 (1.5%)
<i>S. newport</i>	4	Group P	
<i>S. labadi</i>	1	<i>S. adelaide</i>	4 (5.9%)
Group C3		Group S	
<i>S. kentucky</i>	2	<i>S. johannesburg</i>	5
	16 (23.5%)	<i>S. duval</i>	6 (8.8%)
Group D1		Group T	
<i>S. typhi</i>	1	<i>S. waycross</i>	1 (1.5%)
<i>S. dublin</i>	2		
	3 (4.4%)		

*anatum*, *S. montevideo*, *S. abortus bovis*, *S. chester* and *S. johannesburg* were the commonest, and as an outstanding feature, *S. typhi* was only isolated once. 75% of the strains belonged to groups A-E, with groups B and C 1-3 accounting for 52.9% of the types. Members of groups P and S were fairly common.

Of the 9 shigella strains isolated, 3 were identified as

*Sh. schmitzii*, 1 as *Sh. sonnei*, 3 as *Sh. flexneri*, 1 as *Sh. newcastle* and 1 as *Sh. boydii*.

As far as can be seen from the records, 11 of the infected food-handlers were followed up with one, and only 4 with several bacteriological investigations, the results of which were all negative.

The flow of specimens was comparatively constant throughout the year except in July, when the number of requested investigations was doubled. The number of recovered salmonella strains showed little seasonal variation (Table IV).

TABLE IV. SEASONAL DISTRIBUTION OF INFECTED INDIVIDUALS

Month	Salmonella	Shigella	Month	Salmonella	Shigella
Jan. ..	8	1	July ..	4	—
Feb. ..	6	—	Aug. ..	14	—
Mar. ..	6	—	Sep. ..	5	—
Apr. ..	3	2	Oct. ..	9	—
May ..	4	—	Nov. ..	2	2
June ..	4	2	Dec. ..	2	2
			Total ..	67	9

It is noteworthy that the incidence did not increase during the summer months, November to March. The relatively high number of recoveries in August may reflect the delay in sero-typing of the strains isolated from the many specimens received during July. It appears that shigella types may be expected at all times of the year.

## DISCUSSION

The constant request for investigation for the presence of *S. typhi* shows that the major problem confronting the health authorities is to establish whether a prospective food-handler is a carrier, and particularly an excretor of this organism. Owing to the relative importance of other salmonellosis<sup>4,5</sup> the examination was extended to include all salmonellae and shigellae.

It is generally agreed that carriers excrete salmonellae far more often in faeces than in urine.<sup>4,5</sup> Consequently the bacteriological examination of urine only, as is requested by some mines, is of little value; investigation of faeces only would have been a better choice. Since no reliance can be placed on a single negative finding on cultural examination of faeces or urine, whatever method is used,<sup>5,11</sup> and because the excretion of salmonellae in carriers and convalescents may be intermittent,<sup>5,8,9</sup> many specimens may have to be examined before a positive result is obtained. The submission of additional specimens from individuals with one negative finding was so rare that for all practical purposes it was non-existent. The food-handler records do not indicate that those yielding a growth of salmonellae or shigellae were followed up bacteriologically. It is possible that these patients were transferred to isolation wards for continued observation and thus escaped these files. Nevertheless, the conclusion to be drawn is that the present system of bacteriological examination of food-handlers is superficial and inadequate in establishing freedom from enteric infections and, in fact, merely serves as a public tranquillizer. It may be argued that the proper bacteriological control of the food-handlers is impracticable; if this be true, it would possibly be more rewarding to concentrate the efforts on improving the sanitary conditions<sup>10,11</sup> and the education in hygiene of the personnel.<sup>11</sup>

Despite the limited investigations, it was found that 4.3% of the individuals and 4.7% of the specimens of faeces were infected with salmonellae. Thus, the proportion of recoveries

from faecal specimens is of the same order as that obtained during 1957 in our routine laboratory (4%).<sup>2</sup> This is in contrast to expectation, since a considerable proportion of the routine specimens originated from patients with diarrhoea. The possibility exists that the epidemiological environments were different, partly because the specimens originated from geographically different areas, and partly because the two surveys were done in consecutive years.

The group-distribution of salmonella types agrees very accurately with our previous findings in South Africa,<sup>2</sup> but the type-distribution is different. The commonest types in that survey were *S. adelaide*, *S. typhi murium*, *S. labadi*, *S. london* and *S. montevideo*. Except for *S. montevideo*, entirely different strains occupy the first five places in this survey (Table III), and it is striking that the notorious pathogen *S. typhi murium* was rare among the food-handlers. This may also be explained in terms of different epidemiological environments. But it is interesting to speculate on the possibility that the differences may be attributable to inequality in pathogenicity of the strains, or alternatively to variations in clinical susceptibility between the patients with diarrhoeal disorders and the apparently healthy food-handlers who harbour salmonellae.

This raises the question whether the food-handlers from whom salmonellae other than *S. typhi*, or shigellae, were isolated were chronic carriers, or individuals infected for a short period of time but with subclinical symptoms. If all infected persons were chronic carriers, the carrier rate would be at least 4.8% (Table II), but it seems more reasonable to assume that some of them merely harboured the organisms temporarily. This is supported by the failure of re-isolation of enteric pathogens in the 11 subjects from whom we received more than one specimen. On the other hand, if there were a substantial number of subclinical infections with salmonellae in the food-handlers, a seasonal variation in incidence corresponding to that of clinical salmonellosis<sup>2</sup> might be expected; but that was not the case. From the data available it would be unwise to dogmatize on the significance of salmonellae in the excreta of apparently healthy food-handlers.

As regards shigellae, comparatively few strains were isolated; this may possibly be due to the lapse in time between the voiding of the excreta and their arrival in the laboratory. But it may also reflect a low incidence of shigellosis among the food-handlers.

## SUMMARY

In 1958, 2,778 specimens of excreta were examined from 1,565 Bantu who were prospective or employed food-handlers of 19 gold mines in the Transvaal.

No uniformity existed in the selection of specimens, or in the number submitted from the individual food-handler. Generally, one specimen of faeces and one of urine were supplied, but in a quarter of the cases only a single specimen of faeces or urine was provided, on which his suitability as a food-handler had to be assessed. Duplicate specimens were rare. It appears, therefore, that the health authorities on the mines regard a single negative examination of faeces and urine as indicative of the absence of salmonellosis and shigellosis. In a quarter of the cases they are satisfied with even less.

Despite these limited investigations, 75 individuals (4.8%) were found to be infected with salmonella or shigella organisms, all but one being of faecal origin. Accordingly, the submission of urine specimens is of little value. Salmonellae occurred 8 times more frequently than shigellae and comprised 25 different sero-types. *S. typhi* was isolated only once. The shigella strains were of 5 different sero-types.

No seasonal prevalence of infection was observed in this material.

The findings are discussed and the opinion expressed that the present system of bacteriological control of prospective or employed Bantu food-handlers on the mines is inadequate in establishing freedom from *S. typhi* infection. Whether the food-handlers infected with enteric pathogens were chronic carriers or short-time infected individuals cannot be established from the data presented.

We wish to thank the Director of this Institute, Prof. E. H. Cluver, for permission to publish this paper.

## REFERENCES

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## ASSOCIATION NEWS : VERENIGINGSNUUS

## RAILWAY MEDICAL OFFICERS' GROUP (M.A.S.A.)

## NOTICE OF ANNUAL GENERAL MEETING

Notice is hereby given that the Annual General Meeting of Members of the R.M.O. Group will be held at the East London Technical College, Lukin Street, East London, on Wednesday 30 September at 2 p.m. sharp.

## Agenda

1. Minutes of the last Annual General Meeting (circulated).
2. Matters arising out of Minutes and confirmation of Minutes.
3. Annual Report of the Hon. Secretary-Treasurer.
4. The Chairman's Report on negotiations with the Central Sick Fund Board.
5. To receive and adopt Audited Statement of Account for period 15 October 1958 to 31 August 1959.
6. Office Bearers of the Group for year 1959/60.
7. Resolution from Branch Groups.
8. General.

M. Cohen  
Hon. Secretary-Treasurer

## SPOORWEGDOKTERSGROEP (M.V.S.A.)

## KENNISGEWING VAN ALGEMENE JAARVERGADERING

Kennis geskied hiermee dat die Algemene Jaarvergadering van Lede van die Spoorwegdoktersgroep te Oos-Londen Tegniese Kollege, Lukinstraat, Oos-Londen, op Woensdag 30 September om presies 2 nm. gehou sal word.

## Agenda

1. Notule van die vorige Algemene Jaarvergadering (uitgestuur).
2. Sake wat voortspruit uit die Notule en bekragtiging van Notule.
3. Jaarlikse Verslag van die Eresekretaris-Tesourier.
4. Die Voorsitter se Verslag oor onderhandelinge met die Sentrale Siektetefondsraad.
5. Aanbieding en aanvaarding van ge-ouditeerde Rekenstate vir die tydperk 15 Oktober 1958 tot 31 Augustus 1959.
6. Ampsdraers van die Groep vir die jaar 1959/60.
7. Besluite van Tak-Groepe.
8. Algemeen.

M. Cohen  
Eresekretaris-Tesourier

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19 Sept

# Suid-Afrikaanse Tydskrif vir Geneeskunde : South African Medical Journal

VAN DIE REDAKSIE : EDITORIAL

## OOP-HART CHIRURGIE EN DIE SUID-AFRIKAANSE HARTSTIGTING

Oop-hart chirurgie het alreeds 'n gevestigde praktyk geword, nie net in verskeie oorsese lande nie, maar ook in Suid-Afrika. Op verskeie sentra in ons land is spanne dokters wat spesiale eenhede georganiseer het, besig om hierdie soort werk te doen—en dit wel op 'n vlak wat goed vergelyk met die gehalte van die werk wat in ander lande gedoen word. Nadat die eerste fases van die voorlopige eksperimentele werk en die kliniese ontwikkeling min of meer afgehandel is, begin verslae nou te verskyn oor die resultate wat bereik is met operasies op pasiënte self.

Elders in hierdie uitgawe van die *Tydskrif* plaas ons 'n oorsig van die resultate wat bereik is in die gevalle van 30 pasiënte met 'n addendum oor nog 22 verdere gevalle wat in die Grootte Schuur- en die Rooikruis Oorlogsgedenkhospitale vir Kinders, Kaapstad, geopereer is. Hierdie 52 gevalle is behandel met behulp van ekstrakorporeale sirkulasie en die gebruik van die heliks reservoir borrel-oxygenator. Daar mag wel nog verskil van mening bestaan of ekstrakorporeale sirkulasie alleen gebruik moet word, en of hipotermie ook by die operasie ingeskakel moet word.<sup>1</sup> Ook mag daar verskil van mening wees oor die behandeling van intrakardiale toestande wat vroeër deur 'blinde' metodes van benadering verbeter kon word. Uit die resultate wat blyk uit die werk wat ons publiseer, is dit egter duidelik dat die waarde van oop kardiotoromie met behulp van volledige liggaamsperfusie in gevalle van ingewikkelde letsels van die hart, wat voor die opkoms van ekstrakorporeale sirkulasie onherstelbaar was, bo alle twyfel verhef is.

Die voorlopige tegniese en kliniese aspekte van oop-hart chirurgie is alreeds in ons land beskryf,<sup>2,3</sup> en die spesifieke chirurgiese prosedures waaraan voorkeur gegee word by die verskillende soorte hartdefekte, word deur Barnard en sy medewerkers in hierdie uitgawe volledig toegelig (kyk na bladsy 789). Ook is die breëre menslike benadering van die nuwe-probleme van hart-chirurgie volledig uiteengesit deur dr. Cooper in sy waardevolle artikel oor die sielkundige aspekte van aangebore hartsiekte.<sup>4</sup> Ons hoef dus nie weer hierby stil te staan nie.

Wat ons hier egter veral wil doen, is om weereens die finansiële verpligtinge van die samelewing ten opsigte van hierdie belangrike werk te beklemtoon. Toe ons by 'n vorige geleentheid verwys het na die opkoms van oop-hart operasies in Suid-Afrika, het ons aangetoon hoe hoog die koste van hierdie soort chirurgie is.<sup>5</sup> Ons het verwys na die kapitaaluitgawes vir spesiale apparaat, na lopende uitgawes, insluitende uitgawes verbonde aan bloedvoorsiening, en na die personeelbehoefes.

Ons het ook aangetoon dat daar behalwe hierdie meer opvallende redes vir hoë koste ook ander belangrike faktore

is wat nie uit die oog verloor moet word nie, byvoorbeeld die spesiale opleiding van chirurgie in hierdie tegniek, voorbereidende proefnemings met diere en hartnavorsing in die algemeen.

In die eerste plek is die betrokke hospitaallowerhede en navorsingsinrigtings verantwoordelik vir die voorsiening van hierdie fasiliteite, maar die algemene publiek behoort nie daarmee tevrede te wees nie. Navorsing, veral op hierdie gebied, vereis baie geld. Die voorbeeld van die V.S.A., waar groot somme geld vir geneeskundige navorsing beskikbaar gestel word uit vrywillige bydraes van die publiek self, verdien aandag en navolging.

Ons is bly om te kan vermeld dat pogings in hierdie verband alreeds in ons land gedoen word deur die Suid-Afrikaanse Hartstigting. Lidmaatskap van die stigting is oop vir enige persoon wat £1 1s. 0d. tot die fondse van die stigting bydra of onderneem om by te dra. Lede en amptenare van die stigting is oor die land versprei op 'n basis van streeksindeling. Die doelstellinge van die stigting is onder meer: Om geld in te samel om navorsing na die oorsake, beheer en voorkoming, diagnose en ondersoek van alle vorms van hartsiekte moontlik te maak en te beheer; om met die oog op navorsing van die unieke geleentheid in hierdie land gebruik te maak waar hartsiekte verskil by die verskillende rasse-groepe; om navorsing oor daardie soort hartsiektes wat snykundig behandelbaar is te ondersteun en om die metodes van voorkoming en behandeling van die toestande te verbeter en die gebied van snykundige benadering uit te brei; en om die internasionale uitruiling van wetenskaplikes aan te moedig deur middel van reise en om dit moontlik te maak om idees en kennis oor wetenskaplike vooruitgang op die gebied van die voorkoming en behandeling van hartsiektes te versprei.

Alhoewel ons almal uitsien na die dag wanneer ingewikkelde masjiene nie meer nodig sal wees nie en wanneer ons veel eenvoudiger metodes sal kan gebruik, moet navorsing oor oop-hart chirurgie en oor kardiologie in die algemeen sonder onderbreking voortgaan.

Ons wil die Suid-Afrikaanse Hartstigting dus ons volle steun in hierdie belangrike onderneming toesê, en ons wil ook 'n uitnodiging rig aan almal wat in hierdie saak belangstel om 'n gemeenskaplike poging aan te wend om ons navorsings- en kliniese werkers in staat te stel om die hoogste mate van sukses te behaal in hierdie moeilike maar lonende taak.

1. Van die Redaksie (1959): S. Afr. T. Geneesk., 33, 534.

2. McKenzie, M. B. en Barnard, C. N. (1958): *Ibid.*, 32, 1145.

3. Phillips, W. L. en Barnard, C. N. (1958): *Med. Proc.*, 4, 722.

4. Cooper, H. (1959): S. Afr. T. Geneesk., 33, 349.

5. Van die Redaksie (1958): *Ibid.*, 32, 1143.

## OPEN HEART SURGERY AND THE SOUTH AFRICAN HEART ASSOCIATION

Open heart surgery has become an established practice, not only in overseas countries, but also in South Africa. Teams of doctors, who have organized special units, are performing open cardiectomy at various centres in this country, and the quality of this work compares favourably with that done in other countries. Initial experimentation with total body perfusion was followed by clinical development, and reports on the results achieved in human patients are now being published.

Elsewhere in this issue of the *Journal* we publish a review of the first 30 cases, with an addendum on another 22 cases, treated at the Groote Schuur and the Red Cross War Memorial Children's Hospitals, Cape Town. These 52 patients were operated on under total cardio-pulmonary bypass with the helix-reservoir bubble oxygenator. Some differences of opinion may still exist concerning the complementary use of hypothermia<sup>1</sup> and total perfusion in open heart surgery, or concerning the treatment of intracardiac conditions in which an improvement in the patients' condition was possible by the use of indirect or blind methods of surgical treatment. From the results which emerge from the report published in this issue of the *Journal*, it is clear, however, that the value of open cardiectomy with total body perfusion is beyond question in the treatment of complex cardiac lesions that were incurable before the advent of extracorporeal circulation.

The initial experimental and clinical aspects of open heart surgery have already been described in this country,<sup>2,3</sup> and Barnard and his co-workers (see page 789) discuss the methods of correction of certain common congenital defects in some detail. Moreover, in his invaluable article 'Psychological aspects of congenital heart disease,' Cooper<sup>4</sup> has given an indication of what the broader, human approach to the related problems of heart surgery should be. We need not, therefore, dwell on these aspects of the problem.

Let us, however, once again stress the importance of the financial obligations of the community to this branch of medicine. On a previous occasion,<sup>5</sup> when we referred to the advent of open heart surgery in South Africa, we discussed the high cost of open cardiectomy as reflected by hospital accounts for special apparatus, current expenses including the cost of blood, and as shown in the need for trained personnel. We also pointed out that there were other, often less conspicuous but nevertheless equally important factors which should be borne in mind in this respect, viz. the special training of surgeons in these techniques,

preliminary experiments with animals, and cardiac research in general.

It is primarily the responsibility of hospital authorities and research institutions to provide facilities to carry out this work. The obligations of the community should, however, not be overlooked. The cost of unaided research in the fields of heart disease and cardiac surgery is prohibitive. The example set by the USA to meet this exigency would therefore be well worth-while imitating. In that country the community donates large sums of money to enable medical research workers to carry out their investigations.

By the establishment of the South African Heart Association we, in this country, have already begun mobilizing our own resources in the field of cardiac research. Membership of the Heart Association is open to any person who subscribes, or undertakes to subscribe, not less than £1 1s. 0d. per year to the funds of the Association. Members and office-bearers of the Association are scattered all over the country on a regional basis. The objects of the Association are, among others: to raise money to provide and coordinate research into the causes, control and prevention, diagnosis and investigation of all forms of heart disease; to exploit for research purposes the unique situation in South Africa where the prevalence of heart disease is different in the various racial groups; to aid research into and improve methods for the prevention and treatment of those forms of heart disease amenable to surgery and to extend the field of surgery; and to foster international exchange of scientists by travel and interchange of ideas and information about scientific advances in the prevention and treatment of heart disease.

Although we all look forward to the day when the use of elaborate machines will no longer be necessary and when we shall be able to use much simpler methods, research in connection with open heart surgery and heart disease in general must proceed uninterruptedly. We, therefore, wish to assure the South African Heart Association of our full cooperation in their undertaking, and to extend an invitation to all who are interested to support a cause which will enable our research and clinical workers to achieve the greatest possible success in this difficult but rewarding task.

1. Editorial (1959): *S. Afr. Med. J.*, 33, 534.
2. McKenzie, M. B. and Barnard, C. N. (1958): *Ibid.*, 32, 1145.
3. Phillips, W. L. and Barnard, C. N. (1958): *Med. Proc.*, 4, 722.
4. Cooper, H. (1959): *S. Afr. Med. J.*, 33, 349.
5. Editorial (1958): *Ibid.*, 32, 1143.

## THE SOCIETY FOR ENDOCRINOLOGY, METABOLISM AND DIABETES OF SOUTHERN AFRICA

As previously announced, it is proposed to form a new Society, the title of which will be The Society for Endocrinology, Metabolism and Diabetes of Southern Africa. A Steering Committee has been formed consisting of Dr. W. P. U. Jackson, Prof. L. Eales, Drs. R. Hoffenberg, A. J. Walt and C. L. Wicht. The first Annual General Meeting will be held in East London on Monday 28 September at 4.30 p.m. to ratify the Constitution of the Society.

The Hon. Secretary of the Steering Committee (Dr. R. Hoffenberg, Department of Medicine, Groote Schuur Hospital, Observatory, Cape), would like to hear from any medical practitioner or scientist who would care to join the Society. As a temporary measure, to meet initial expenses, an entrance fee of 10s. is being charged. It is emphasized that this is *not* a specialist organization and interested general practitioners and laboratory workers are invited to join. The question of a form of lay membership, as that of the American Diabetic Association, is under consideration.

## SOME EXPERIENCES WITH INTRACARDIAC SURGERY USING THE HELIX-RESERVOIR BUBBLE OXYGENATOR WITH TOTAL CARDIO-PULMONARY BYPASS

A REVIEW OF THE FIRST 30 CASES TREATED AT THE GROOTE SCHUUR AND RED CROSS WAR MEMORIAL CHILDREN'S HOSPITALS, CAPE TOWN

C. N. BARNARD, M.D., M.MED. (CAPE TOWN), M.S., PH.D. (MINNESOTA); W. L. PHILLIPS, M.B., B.Ch. (RAND), M.R.C.P. (LOND.), F.R.C.S. (ENG.); D. R. DE VILLIERS, M.Sc. PHYS., M.B., Ch.B. (CAPE TOWN); R. D. CASSERLEY, Ch.M. (CAPE TOWN); R. P. HEWITSON, M.B., Ch.B. (CAPE TOWN), F.R.C.S. (EDIN. and ENG.); R. L. VAN DER RIET, M.B., Ch.B. (CAPE TOWN), F.R.C.S. (ENG.); and M. B. MCKENZIE, M.B., Ch.B. (CAPE TOWN)

*Department of Surgery, University of Cape Town*

The rapid progress in cardiovascular surgery makes advisable periodic review of problems and achievements. The discussion of surgical procedures must be in part personal, and this review reflects to some extent the opinions and experiences of the authors. It must be remembered that, in a field where progress is so rapid, further experience may invalidate some concepts which at present appear proper.

It is not within the scope of this paper to give credit to the many pioneers in this field but it may be worth while noting the great role played by the experimental laboratory in the development of this branch of surgery. There is no doubt that the vast body of young surgeons from all over the world who have had access to such laboratories are the ones to whom one must give the most credit for the rapid advances in this field.

The object of this paper is to present the first 30 patients operated on under total cardio-pulmonary bypass with the helix-reservoir bubble oxygenator in Cape Town. After initial experimentation with total body perfusion in the Department of Surgery<sup>1</sup> clinical development followed<sup>2</sup> and open heart surgery is now performed every week both at Groote Schuur Hospital and the Red Cross War Memorial Children's Hospital.

### *Selection of Patients*

During the early stages, patients with easily repairable lesions were selected but, as experience of the team increased, more complex lesions were corrected (Table I). These patients were all first investigated by members of the Cardiac Clinic, Groote Schuur Hospital, to determine the nature and severity of their lesions. Only those patients in whom objective studies indicated significant haemodynamic derangement were submitted for surgery.

The ages of the 30 patients ranged from 7 years to 44 years. There were 15 Europeans, 13 Coloured and 2 Bantu. Of these patients 3 had been operated upon before for their cardiac lesions. Case 7 had had a left thoracotomy and left atrial exploration for suspected mitral stenosis, when a myxoma was diagnosed. Case 20 had undergone left thoracotomy with pulmonary-systemic anastomosis in 1949, and in 1954 right thoracotomy and blind pulmonary valvotomy were performed. Case 30 had had a left thoracotomy and mitral valvotomy.

### *Pre-operative Preparation*

The important aspects of the pre- and post-operative care of patients undergoing open heart surgery have been dealt with fully in a previous publication.<sup>3</sup> The careful preparation of the operative field with 'phisohex' and the pre-operative

use of antibiotics and a good diet supplemented by vitamins will assist in obtaining smooth convalescence free from infection and complications.

Patients with a high pulmonary flow, or pulmonary congestion, are prone to infections of the tracheo-bronchial tree and lungs and should be adequately treated before surgery. Overt or incipient heart failure should be treated with salt restriction, diuretics and digitalization, but routine pre-operative digitalization is not recommended.

Tracheotomies are sometimes performed pre-operatively in patients with high pulmonary-artery pressures and resistances, to enable one to deal more adequately with secretions post-operatively and to assist respiration in this period if necessary.

Accurate pre-operative weight should be obtained to enable one to calculate the change in blood volume when compared with the immediate post-operative weight.

### *Anaesthesia*

A simple technique with minimal disturbance to the patient from the anaesthesia has been used.

Premedication with secobarbital and atropine has been used; this produces a patient who is usually sleeping quietly when brought to the theatre. During the preliminary operative procedures of placement of the monitoring catheters, thoracotomy, and placement of the catheters linking the patient to the bypass machine, only light anaesthesia is required. This is achieved by controlled respiration *via* the endotracheal route, with nitrous oxide and oxygen and, if necessary, minimal doses of ether.

Requirements during the bypass are absence of respiratory movements, and hypnosis. These conditions are adequately obtained by means of curare and thiopentone, and it is found that minimal quantities only need be used.

Post-bypass, during closure of the thorax, nitrous oxide and oxygen anaesthesia is all that is necessary; as a result, the patients are fully conscious and cooperative within minutes of completion of the operation.

During these prolonged procedures—ranging from 5 to 10 hours—meticulous unceasing vigilance by the anaesthetist is necessary to make it possible to cope with any untoward occurrences.

### SURGICAL TECHNIQUE

#### *Surgical Approach*

Three types of incision were used: bilateral thoracotomy with transverse sternotomy in 17 cases, median sternotomy in 11 cases, and right thoracotomy in 2 cases. The transverse

thoracotomy gives good access to all the important structures but there is little doubt that with this approach the post-operative pulmonary complications are higher than with the median sternotomy because of the extensive and painful nature of the wound. The median sternotomy is an easier, faster and much less painful incision and we are making use of it whenever possible. This incision, however, has the disadvantage that dissection of the ductus area and control of a patent ductus is difficult, especially in cases where the heart and pulmonary artery are grossly enlarged. In all our cases it has been possible, where necessary, to expose the ductus by dissecting intrapericardially down the superior margin of the pulmonary artery. We prefer a right thoracotomy through the bed of the fifth rib in lesions to be repaired through a left atriotomy. A giant left atrium may interfere with the taping of the inferior vena cava, when an additional incision will be needed through a lower space.

With all three incisions it is possible to isolate an internal mammary artery, which is then cannulated with a thin polythene tube for arterial pressure recording.

Once the pericardium is opened, the pre-operative diagnosis can be confirmed by noting the size of the various chambers of the heart and the roots of the great vessels, by digital exploration of the right atrium through the right auricular appendage, and by measurement of intracardiac pulmonary-artery and aortic pressures. A search should be made for anomalous venous return, especially for a left superior vena cava which, if present, should be occluded during the bypass. If a patent ductus has been diagnosed pre-operatively, it must be ligated but, in patients with ventricular septal defects, even if not diagnosed, a patent ductus should always be sought for.

#### *Preparation for Cardio-pulmonary Bypass and Commencement of Bypass*

In previous publications these have been fully discussed.<sup>1,2</sup> Since then we have made no major modifications in our technique.

#### INTRACARDIAC PROCEDURES

A wide variety of lesions have already been managed by open cardiectomy with total cardio-pulmonary bypass (Table I). There are still differences of opinion about the best technique for the correction of some defects encountered. Time and experience will solve whatever uncertainties may exist; in the meantime, each surgeon must decide from his own experience, and that of other surgeons, what technique gives the best results.

#### *Ostium Secundum: Atrial Septal Defects*

The only acceptable treatment for an atrial secundum septal defect is one that produces a complete correction with low mortality. We now employ extracorporeal circulation as a routine for the repair of these lesions and have successfully corrected 12 without fatality (Table II). The defects varied in size from 2 to 3.5 cm. in diameter. Multiple defects were found in 3 patients. One patient (case 21) had associated mitral stenosis and one (case 28), with a sinus-venous type of secundum defect, had an anomalous return of the superior pulmonary vein.

Repair was effected by a running 3-0 silk suture doubly sewn and reinforced with interrupted mattress sutures. Except in the patient with the sinus-venous defect, where an

TABLE I. ANALYSIS OF CASES

No.	Age (yrs.)	Race Sex	Date of Operation	Type of Lesion	Result
1	18	CF	28.7.58	Pulm. sten. (valv.)	Good
2	14	EF	18.8.58	ASD (ost. sec.)	Good
3	9	EF	8.9.58	ASD (ost. sec.)	Good
4	41	CM	29.9.58	ASD (ost. sec.)	Good
5	13	CF	13.10.58	VSD + PDA (c pulm. hyperten.)	Died 14.10.58
6	44	EM	20.10.58	ASD (ost. sec.)	Good
7	36	NM	26.10.58	L. atrial myxoma	Good
8	24	CF	10.11.58	ASD (ost. sec.)	Good
9	15	EM	17.11.58	VSD (c moderate pulm. hyperten.)	Good
10	21	CF	8.12.58	VSD (c pulm. hyperten.)	Good
11	10	EF	15.12.58	Ost. prim. (endocardial-cushion def.)	Good
12	13	CF	12.1.59	VSD (c pulm. hyperten.)	Good
13	7	NM	19.1.59	Tetral. Fallot	Good
14	11	EM	21.1.59	ASD (ost. sec.)	Good
15	13	EM	26.1.59	ASD (ost. sec.)	Good
16	15	CF	9.2.59	Ost. prim. (endocardial-cushion def.)	Died 10.2.59
17	12	EF	16.2.59	Aortic sten. + pulm. valv. sten. + ASD	Died 16.2.59
18	11	EM	2.3.59	Pulm. sten. (valv.)	Good
19	14	EF	9.3.59	ASD (ost. sec.)	Good
20	16	EM	16.3.59	Tetral. Fallot	Good
21	24	EF	23.3.59	ASD (ost. sec.)	Good
22	20	CF	8.4.59	VSD (c pulm. hyperten.)	Good
23	12	CM	13.4.59	Pulm. sten. (infund.) c tricuspid incomp.	Died 14.4.59
24	36	EF	20.4.59	ASD (ost. sec.)	Good
25	27	CM	27.4.59	Pulm. sten. (infund.) + VSD	Good
26	8	EM	18.5.59	VSD (c pulm. hyperten.)	Good
27	7	EM	25.5.59	VSD (+ pulm. sten., valv. + infund.)	Good
28	12	CF	26.5.59	ASD (c anomalous pulm. venous return)	Good
29	8	CM	2.6.59	ASD (ost. sec.)	Good
30	31	CM	8.6.59	Mitr. sten.	Good

c = cum (with). ASD and VSD = auricular and ventricular septal defect.

TABLE II. ATRIAL SEPTAL (OSTIUM SECUNDUM) DEFECTS

Case No.	Type	Repair	Result
2	Defect $\pm$ 3 cm. diam.		
3	Satellite defect (0.5 cm. diam.)	Suture	Good
4	Defect $\pm$ 3.5 cm. diam.	Suture	Good
6	Defect $\pm$ 2.5 cm. diam.	Suture	Good
8	Defect $\pm$ 2 cm. diam.		
14	Satellite defect 3 mm. diam.	Suture	Good
14	Defect $\pm$ 3.5 cm. diam.		
15	Satellite defect (0.5 cm. diam.)	Suture	Good
19	Defect 2.5 cm. diam.	Suture	Good
21	Defect $\pm$ 3 cm. diam.		
24	Assoc. mitral stenosis	Suture	Good
28	Defect $\pm$ 2.5 cm. diam.		
28	Defect $\pm$ 2.5 cm. diam.		
28	Assoc. anomalous pulmonary venous return	Ivalon patch	Good
29	Defect $\pm$ 2 cm. diam.	Suture	Good

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Ivalon patch was sewn over the defect in order to partition off the entrance of the superior pulmonary vein and superior vena cava correctly, all lesions were completely and securely corrected by simple suture (Fig. 1) and there is no reason

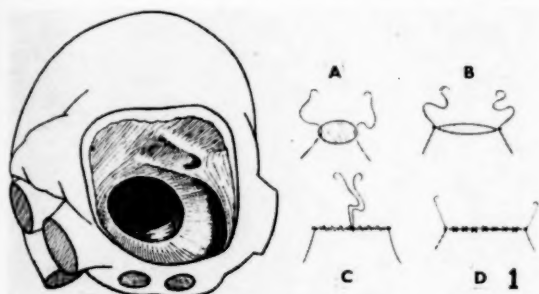


Fig. 1. Diagram of typical ostium-secundum defect. Insets A to D demonstrate simple method of direct repair used for most defects.

to believe that a residual shunt exists. The correctness of this statement will be tested later by re-catheterization.

#### Endocardial-cushion Defects

Failure of the embryologic endocardial cushions to develop normally and fuse in the mid-line of the common atrioventricular canal results in abnormalities of varying degree in atrial septation, ventricular septation, and atrioventricular valve-leaflet formation. The specific pathological abnormalities encountered vary from the simple ostium-primum atrial septal defect to a persistent atrioventricular canal. Atrioventricular valve malformation of varying extent is almost universally present.

Considerable progress has now been made in the surgical treatment of these lesions. Only open cardiomy with extra-corporeal circulation should be used for their repair. Closed techniques, hypothermia with inflow stasis, and the atrial well, are methods not satisfactory for the management of these repair procedures.

The extent of the operative repair depends on the type

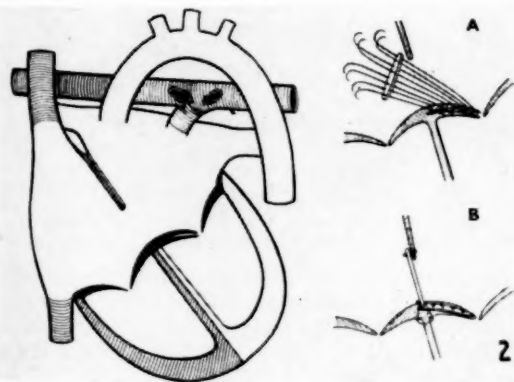


Fig. 2. Diagram of partial type of endocardial-cushion defect. Inset A shows closure of cleft leaflet of mitral valve with interrupted sutures reinforced with compressed Ivalon strip. Inset B demonstrates closure of ostium-primum defect with Ivalon patch after correction of valve defect.

of defect. In patients with only an ostium-primum type of intra-atrial communication, it may be possible to approximate the edges with interrupted 3-0 mattress sutures. If the defect is large, direct repair will produce undue tension on the sutures, and an Ivalon patch sewn over the defect will provide a much securer closure (see under 'ventricular septal defects'). The sutures are accurately placed in the lower margin of the defect to avoid incorporating the mitral and tricuspid leaflets in the repair.

When a partial type is encountered, the cleft mitral or tricuspid valve is first repaired with interrupted 4-0 silk sutures. We prefer to tie these sutures over a strip of compressed Ivalon (Fig. 2). After the valvular repair is accomplished the septal defect is repaired in the manner already described.

A complete atrioventricular-communis defect with common mitral and tricuspid leaflets and defects in atrial and ventricular septation is the most complex of all cardiac septal defects to repair. The first step is the repair of the cleft atrioventricular valves. A thin strip of compressed Ivalon is used to reinforce this repair, and the middle of this strip is used in the repair of the ventricular septal defect (Fig. 3). The atrial defect is then repaired as before. Cardiac

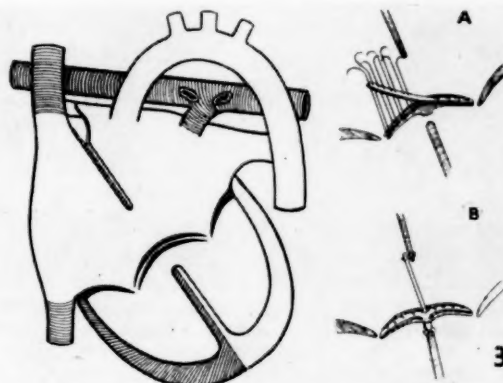


Fig. 3. Repair of complete endocardial-cushion defect showing extensive reconstruction of A-V valves and repair of defects in atrial and ventricular septation.

asystole is not used, for in the beating heart one can better assess mitral and tricuspid regurgitation than in the arrested heart. Further, if the heart is beating during the placement

TABLE III. ENDOCARDIAL CUSHION (OSTIUM PRIMUM) DEFECTS

Case No.	Type	Repair	Result
11	Partial endocardial-cushion defect: Ost. prim. ASD ( $\pm 3$ cm. diam.) and assoc. cleft of antero-medial leaflet of mitral valve producing mitral incompetence.	Suture of cleft mitral valve. Ivalon patch repair of septal defect.	Good
16	Complete endocardial-cushion defect: Ost. prim. ASD ( $\pm 3$ cm. diam.). Complete splitting of aortic leaflet of mitral valve and mural leaflet of tricuspid valve VSD ( $\pm 1$ cm. diam.).	Suture of mitral and tricuspid valve leaflets incorporating an Ivalon strip. Ivalon patch repair of ASD and VSD.	Died

and tying of stitches, the production of heart block can immediately be detected and the causative suture removed.

Two patients with endocardial-cushion defects were operated upon in this manner (Table III). One had a partial lesion with a cleft mitral leaflet (case 11), the other (case 16) suffered from the complete form. This last patient died 24 hours after the operation from pulmonary oedema. Autopsy revealed a complete correction of the lesion.

#### Ventricular Septal Defects

The majority of patients with ventricular septal defects selected for surgical treatment had a ventricular septal defect located immediately beneath the aortic-valve ring.



Fig. 4. High ventricular septal defect seen from the left ventricular aspect. Note the close proximity to the aortic valve.

When viewed from the left ventricular aspect, the opening is immediately inferior to the right aortic cusp, the adjacent portion of the posterior aortic cusp, and the intervening commissure. Thus there is no superior remnant of ventricular septum below the aortic ring itself (Fig. 4). From the right ventricular aspect the region of the defect is partially obscured by the crista supraventricularis, the tricuspid valve, and the papillary muscle of the conus (Fig. 5).

The remaining defects are situated either immediately beneath the pulmonary valve or in the region of the right ventricular inflow tract<sup>4</sup> and include defects in the muscular septum, which are often multiple and may be hidden between the muscle trabeculations. The position of the defect can easily be located when the right ventricle is opened by observing the site through which oxygenated blood enters the right ventricular cavity from the left ventricle with each heart beat.

Ventricular septal defects are best approached through a right ventriculotomy, which usually extends from a point just below the pulmonary-valve ring downwards nearly to the margin of the heart. This incision is placed to avoid major coronary branches. Induced cardiac arrest has clearly become a fundamental necessity to the accurate repair of



Fig. 5. Diagram showing the relations to a high ventricular septal defect viewed from the right ventricular aspect of (A) crista supraventricularis, (B) tricuspid valve, (C) papillary muscle of the conus.

TABLE IV. INDUCED CARDIAC ARREST WITH 2.5% SOLUTION OF POTASSIUM CITRATE

Case No.	Amount Used	Duration of Arrest (minutes)	Recovery
5	30 c.c.	20	Spontaneous return of sinus rhythm.
9	40 c.c.	32	Ventricular fibrillation c successful defibrillation
13	30 c.c.	48	Ventricular fibrillation c successful defibrillation.
17	25 c.c.	30	Initial return to sinus rhythm. Ventricular fibrillation followed cessation of by-pass—no response to electrical defibrillation.
20	50 c.c.	60	Spontaneous return of sinus rhythm.
22	50 c.c.	33	Ventricular fibrillation c successful defibrillation.
27	60 c.c.	20	Ventricular fibrillation c successful defibrillation.

c = cum (with)

these defects (Table IV). We use 2.5% solution of potassium citrate in oxygenated blood as suggested by Melrose<sup>5</sup> and induce arrest after the ventriculotomy, thus preventing distension of the relaxed muscle by blood still entering the heart from the lungs.

The edges of the incision are kept apart by suitably placed traction sutures. Two cardiotomy suckers are used, one placed through the tricuspid valve into the right atrium and one placed in the pulmonary artery. A dry field is obtained



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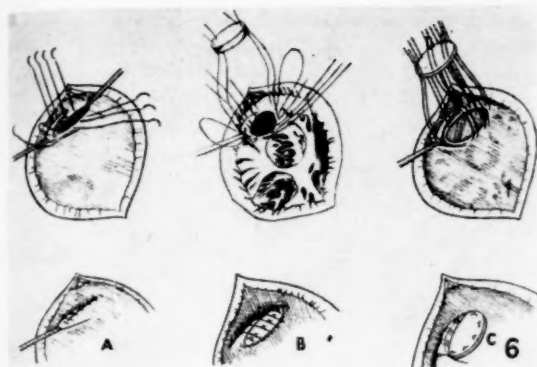


Fig. 6. Diagram illustrating the three methods of repair of ventricular septal defect. (A) Direct suture repair. (B) Sutures tied over Ivalon pledget. (C) Circumferentially sutured Ivalon patch.

in this way and the anatomy of the defect can be studied and a plan of the method of its closure formulated. Three methods of closure have been used (Fig. 6 and Table V), viz. direct sutures, sutures tied over an Ivalon pledget, and a circumferentially sutured Ivalon patch. As yet there is no unanimity

TABLE V. VENTRICULAR SEPTAL DEFECTS

Case No.	Type	Repair	Result
5	PDA (1 cm. diam.) VSD (1.5 cm. diam.) in membranous portion of septum. Aortic insuff. due to prolapse of one aortic leaflet into the VSD	Ligation of PDA. Suture repair of defect.	Died
9	Defect in membranous area ( $\pm$ 2 cm. diam.)	Suture	Good
10	Defect in membranous area ( $\pm$ 2 cm. diam.)	Suture	Good
12	2 defects in membranous septum (0.5 cm. diam.). 1 defect in muscular septum (0.5 cm. diam.)	Suture repair of 2 defects. Ivalon pledget tied in sutures in repair of other defect	Good
22	Defect in membranous area ( $\pm$ 1.5 cm. diam.)	Ivalon patch repair	Good
26	Defect ( $\pm$ 2.5 cm. diam.) in posterior portion of muscular septum. 2 satellite defects in muscular septum ( $\pm$ 3 mm. diam.)	Suture repair of all defects	Good
27	Defect ( $\pm$ 2.5 cm. diam.) in membranous portion of septum. Associated valv. + infund. pulm. sten.	Suture repair of defect. Pulmonary valve commissurotomy. Infundibular resection	Good

of opinion about the best method, and it is for the surgeon to decide which method gives the best results in his hands. Whichever method is employed the following points are most important for the successful closure of these defects:

(a) A clear three-dimensional concept of the compact, complex and somewhat obscure anatomy of this region.

(b) Closure must be accomplished without undue tension. These defects are usually ovoid apertures and if direct suture is chosen as the method of repair the line of repair must be parallel to the long axis of the oval. In the commonly

encountered high defects the line of repair runs parallel to the aortic annulus (Fig. 6).

(c) Sutures should be tied with just sufficient tension to approximate and this is accomplished best in the arrested heart.

(d) The repair should always start at the most inaccessible angle of the defect and end at the most accessible angle. Thus, in the high membranous defect, whether repair is effected by direct suture or by insertion of a patch, the repair should start at the important postero-inferior angle and end at the antero-superior angle just below the crista supraventricularis.

(e) Sutures should be placed in such a manner that they have a firm hold preventing them from tearing loose but, on the other hand, they should be placed so as not to damage vital structures. Damage to the conduction system causing a complete heart block is usually caused by sutures placed at the postero-inferior angle of the high membranous defect.<sup>6,7</sup> This danger can be minimized by using the edge of the insertion of the septal leaflet of the tricuspid valve for holding the sutures in this area (Fig. 6).

Damage to the aortic valve in the placing of stitches in the aortic annulus, which will form the superior border in the repair of high membranous defects, can always be prevented if the aortic valve leaflets are clearly visualized. During cardiac arrest the cusps do not bulge and their margins may be difficult to identify. This difficulty can be overcome by momentarily releasing the clamp on the ascending aorta and allowing the blood to fill the cusps and bulge them into view. The heart is restarted before the last two or three stitches are tied. This allows an escape for air and blood from the left side of the heart until the beat is effective. After the last stitches are tied the closure is carefully inspected for residual leaks, which must be corrected, and the remainder of the ventricular septum is then examined for other defects as described above.

The ventriculotomy is closed with running 3-0 silk sutures doubly sewn. Before complete closure the tape around the catheter in the superior vena cava is released and the right ventricular cavity allowed to fill with blood.

In 7 patients (Table V) in this series a ventricular septal defect was the major disability. An Ivalon patch was necessary for adequate closure of the defect in 2 patients (cases 9 and 22). In one (case 12) sutures were tied over an Ivalon pledget, and in the remaining cases the direct suture technique was used. Valvular pulmonary stenosis was present in one patient (case 27) and this was corrected. One patient (case 5) had a patent ductus arteriosus, which was ligated before going on bypass. This patient also suffered from aortic incompetence, which was not corrected. Two patients (cases 12 and 26) had multiple ventricular septal defects, all of which were closed by direct suture. In 2 cases the pulmonary-artery pressure was greater than 75% of the systemic pressure.

One patient (case 5) died 24 hours after the operation. This was due to the residual aortic incompetence and excessive post-operative bleeding. The remaining 6 patients are all well and have left hospital. No heart blocks were encountered.

#### Pulmonic Stenosis

Pulmonic stenosis with presumably intact ventricular septum is frequently a complex abnormality, for the stenosis may be valvular, infundibular or both, and may be associated

with an atrial septal defect or even with a small ventricular septal defect. The surgical treatment which provides optimal conditions for restoration of normal anatomy utilizes extracorporeal circulation and any or all of ventriculotomy, atriotomy and pulmonary arteriotomy. Valvular stenosis is corrected (through an anterior incision in the main pulmonary artery) by radial incisions made with scissors to produce a tricuspid or bicuspid valve (Fig. 7). The infundibular region

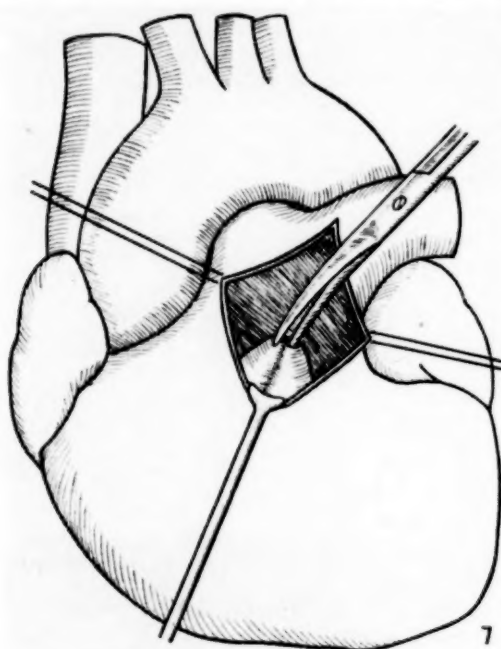


Fig. 7. Stenotic pulmonic valve incised along vestigial commissure through pulmonary arteriotomy.

is then inspected and palpated. If an infundibular stenosis is expected the ventricle must be opened. Infundibular stenosis may be relieved by excision of redundant infundibular muscle and myocardium. Great care must be taken on the postero-medial aspect of the floor of the infundibulum not to injure the aortic annulus, which is in close proximity to this area. In some patients it may be necessary to excise the hypertrophied moderator band to provide an adequate outflow to the right ventricle (Fig. 8). In some cases, especially where the infundibular stenosis is high, resection of redundant muscle may not completely relieve the stenosis and the insertion of a pear-shaped compressed Ivalon patch (base towards the pulmonary artery) in the right ventricular outflow tract may be required.<sup>8</sup> If the valve ring is narrow the surgeon must not hesitate to cut across this and extend the patch well onto the main pulmonary artery. Residual pulmonary stenosis is much more dangerous than a slight pulmonary incompetence.

A total of 4 patients with this condition have been operated on in this series (Table VI). In 2 of these only valvular stenosis was present, in one pure infundibular stenosis, and in one infundibular stenosis plus a small ventricular



Fig. 8. Photograph of some of the muscle resected from outflow tract of right ventricle in patient with infundibular pulmonary stenosis.  $\times 3$ .

TABLE VI. PULMONARY STENOSIS

Case No.	Type of Lesion	Repair	Pressures		Result
			IMA	Post-op.	
1	Valv. sten. (5 mm. diam. aperture)	Pulm. valve commissurotomy	Pre-op. 110/80 RV 130/15 PA 27/17	80/60 40/7 25/12	Good
18	Valv. sten. (4 mm. diam. aperture)	Pulm. valve commissurotomy	IMA 125/80 RV 145/0 PA 20/0	110/80 40/5 30/20	Good
23	Infund. sten. (c. assoc. tricuspid incompet.)	Infund. resection	IMA 80/50 RV 140/40 PA 31/17	84/40 52/10 12/2	Died
25	Infund. sten. VSD in membranous part of septum	Infund. resection. Suture repair of VSD	IMA 122/75 RV 219/5 PA 20/2	— 40/5 20/15	Good

septal defect. One patient had extensive peripheral oedema with gross tricuspid incompetence and died 48 hours after the operation in pulmonary oedema. It will be seen from Table VI that pre-operative right ventricular pressures ranged from 219/5 mm. Hg to 130/15 and the pulmonary-artery pressures from 31/17 to 20/2. The gradient across the stenosis ranged from 178 mm. Hg to 88. Immediately after surgery pressures were again measured and the gradient now varied from 20 mm. Hg to 10, indicating an adequate relief of the obstruction.

#### Tetralogy of Fallot

The significant abnormalities in this syndrome are the ventricular septal defect, pulmonic stenosis, and stenosis or atresia of the pulmonary artery. The septal defect is generally large and located in the membranous area of the septum. The pulmonic stenosis is usually infundibular or infundibular and valvular, rarely only valvular. Although the pulmonary artery is always smaller than the aorta, it may vary in actual size from an atretic cord of hypoplastic vessel to an artery scarcely smaller than normal.

As little can be done surgically to increase the size of the pulmonary artery the correction of this anomaly consists in closure of a ventricular septal defect and correction of the pulmonic stenosis. The techniques of dealing with both of these have been discussed above.

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8 R.  
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11 M.  
12 S.H.  
13 T.K.  
14 C.E.  
15 P.R.  
16 D.D.  
17 J.C.  
18 W.  
19 E.C.  
20 P.K.  
21 Y.Y.  
22 E.A.  
23 J.A.  
24 S.R.  
25 J.G.  
26 A.C.  
27 J.P.  
28 R.S.  
29 A.R.  
30 E.A.

(a) N

Two patients were operated upon for correction of tetralogy of Fallot, with no deaths (Table VII). As stated above, one patient (case 20) had undergone 2 previous operations for relief of his disability, with only temporary success. With total cardio-pulmonary bypass we were able to close

TABLE VII. TETRALOGY OF FALLOT

Case No.	Lesions	Repair	Pressures (mm. Hg)		Result
			Pre-op.	Post-op.	
13	VSD in membranous part of septum (2.5 cm.). Overriding of aorta. Pulm. infund. sten.	Ivalon patch repair of VSD. Infundibular resection and Ivalon patch incorporated in roof repair of RV outflow tract	IMA 95/70 IVC 20 RV 81/4 MPA 22/15	110/95 14 52/5 47/12	Good
20	VSD in membranous part of septum (3.5 x 2 cm.). Extensive overriding of aorta. Infund. sten. c partial correction of valv. sten.	Ivalon patch repair of VSD. Infundibular resection	IMA 120/90 IVC 18 RV 125/5 MPA 20 Infund. region 30/10	100/75 15 60/15 40/18 40/12	Good

the ventricular septal defect with an Ivalon patch and correct the pulmonic stenosis by an adequate infundibular resection. The other patient (case 13) also needed an Ivalon patch for closure of the septal defect but, in addition, for complete relief of the infundibular stenosis an Ivalon patch was sutured into the roof of the outflow tract of the right ventricle.

#### Other Lesions

One patient (case 17) with aortic stenosis, pulmonic stenosis, and an ostium-secundum defect, was operated upon. The aortic stenosis was relieved through an aortic incision after potassium citrate arrest, the pulmonic stenosis through a pulmonary arteriotomy, and the ostium-secundum defect through a right atriotomy. The heart failed soon after going off bypass and although the patient was placed again on total cardio-pulmonary bypass all attempts to re-establish

an effective heart beat failed. Autopsy revealed extensive endocardial fibro-elastosis.

A left atrial myxoma was successfully removed through a left atriotomy (case 7); this case is the subject of a separate report.<sup>9</sup>

The last case in this series was the correction of mitral stenosis in a patient (case 30) in whom a closed valvotomy was performed 3 years before. This was successfully done with the use of total cardio-pulmonary bypass. In all we have operated upon 30 patients with 4 deaths (13.3%).

#### THE PERFUSION

The perfusion (Table VIII) presented no difficulty in any of the cases. In the last 12, stainless steel cannister 'debubblers' were employed (Lillehei—personal communication).

Flow rates were calculated in c.c. per kg. per minute, varying according to the size of the patient, a larger flow per kg. being used in the smaller-sized patients. The minimum flow rate in this series was 45 c.c. per kg. per minute, and the maximum 100.

The perfusion time varied between 14 and 135 minutes (average 51.7). Venous drainage was obtained by gravity, a difference of approximately 25 cm. being established between the height of the operating table and that of the venous well. The venous pressures varied between 5 and 25 mm. Hg with a mean of 13.3.

Return of oxygenated blood was always into the right common femoral artery. The mean perfusion pressures varied from 55 mm. Hg to 100, with an average of 66.3.

Oxygenation and carbon dioxide removal were always adequate and blood destruction minimal.

Removal of blood from the open heart was never a real problem. It was accomplished by gentle suction and the blood was returned to the oxygenator immediately. The

TABLE VIII. ANALYSIS OF BLOOD FLOW, PRESSURES, BLOOD DESTRUCTION AND GAS ANALYSIS DURING PERFUSION

Case No.	Name	Wt. (kg.)	Duration			Flow Rate per min. (c.c.)		Catheters (French gauge)			Venous Perfusion Pressure (mean) (mm. Hg)	Arterial Perfusion Pressure (mean) (mm. Hg)	EEG	Gas Analysis of Blood from Oxygenator at end of Bypass				Haemo-lysis (mg. %)
			Anaes. (hrs. and mins.)	Op. (hrs. and mins.)	Perfus. (mins.)	Total	Per kg.	SVC	IVC	FA				Oxygen %		CO <sub>2</sub> vols. %		
														Art.	Ven.	Art.	Ven.	
1	J.P.	40	6 12	5 50	15	2800	70	36	40	18	10	55	Satis.	100	93	28	32.9	Not done
2	R.J.	36	5 22	5 10	25	2700	75	36	40	18	15	55	(a)	96	89	26	31	23.2
3	H.W.	33	5 36	5 10	29	2300	70	34	36	16	19	50	Satis.	98	76	34	34	28.0
4	N.V.	70	7 44	7 2	26	3260-3500	45-50	40	40	22	20	50	Satis.	Not analysed				Not done
5	M.J.	37	8 30	7 28	55	2200-2550	60-65	36	40	18	8	70	Satis.	100	78	30	38.1	Not done
6	N.V.R.	—	6 28	5 35	31	3000-3350	50-55	40	40	24	9	60	Satis.	100	79	51	52.5	Not done
7	S.W.	57	8 56	8 12	45	2850-3705	50-65	40	40	20	10	65	Satis.	97	63	46	46	55.1
8	R.B.	53	8 50	7 36	22	2920	55	40	40	20	20	65	(a)	100	70	38	39	Not done
9	S.W.	54	8 30	8 0	55	2720-3180	50-60	40	40	20	11	50	Satis.	100	67	35.4	40	52.0
10	A.S.	52	9 30	8 36	50	2860	55	40	40	20	15	55	Satis.	100	73	44	48	43.2
11	M.M.	24	7 31	7 2	73	1440	60	36	40	16	23	55	Satis.	98	70	33.2	40	68.9
12	S.H.	50	8 5	7 3	64	2750	55	36	40	18	18	70	Satis.	98	70	25.1	42.5	61.0
13	T.K.	20	9 7	8 30	88	1200-1400	60-70	36	36	14	14	100	Satis.	100	75	36.4	43	81.0
14	C.B.	26	7 30	6 39	24	1560-2080	60-80	30	40	14	20	65	Satis.	100	85	36.7	36.7	19.6
15	P.R.	46	6 31	5 35	31	2760	60	36	40	18	21	75	Satis.	95	73	35.7	40.8	31.2
16	D.H.	30	8 42	8 10	93	2100	70	40	40	20	17	95	Satis.	94	42	29.5	34	83.1
17	J.C.	26	7 2	6 42	135	1820-2080	70-80	36	36	16	—	75	(b)	Not taken		Not done		Not done
18	W.D.	35	6 20	5 19	14	2450	70	40	40	16	15	70	Satis.	99	78	35	45.5	Not done
19	E.G.	40	5 40	5 13	27	2800-3000	70-75	40	40	18	10	80	Satis.	100	75	39.5	41.8	Not done
20	P.K.	57	10 22	9 32	99	3135-2850	50-55	40	40	20	15	80	Satis.	95	75	30.9	45.0	101.0
21	Y.H.	42	6 49	6 0	29	2520-2730	60-65	40	40	18	16	55	Satis.	Not analysed				Not done
22	E.A.	48	7 32	6 50	80	2880-3120	60-65	40	40	18	16	55	Satis.	Not analysed				Not done
23	J.A.	32	7 14	6 8	69	2240-3200	70-100	40	40	16	25	100	Satis.	100	66	37.2	46	80
24	S.R.	52	8 29	7 52	32	3120-3380	60-65	36	40	22	10	65	Satis.	100	76	36.0	36.4	21.9
25	J.G.	62	7 56	7 21	45	3410-3720	55-60	40	40	22	20	70	Satis.	100	38	39.7	44.9	75
26	A.G.	22	6 55	5 54	75	1650-1870	75-85	34	34	18	13	85	Satis.	96	53	38.9	43.9	64.6
27	J.P.	20	6 47	6 1	77	1600-1900	80-95	32	36	16	20	90	Satis.	94	65	34	50	68.3
28	R.S.	32	5 17	4 21	62	2400-2720	75-85	32	40	18	5	75	(a)	93	52	37.8	38.2	40.3
29	A.R.	—	4 33	4 33	28	1600-1400	70-80	32	40	18	8	—	(a)	98	60	42.6	48.6	32.2
30	E.A.	69	6 17	5 39	54	3450-3795	50-55	40	40	22	9	65	Satis.	97	39	44.4	47.6	121.5

(a) Not recorded.

(b) Gradual deterioration from cessation of cardiac arrest period.

electro-encephalogram was satisfactory throughout perfusion in all cases.

#### POST-OPERATIVE

Post-operative care has been previously discussed.<sup>3</sup> In the immediate post-operative phase careful measurement and replacement of blood loss from the chest catheters and care of the tracheobronchial tree are amongst the most important aspects leading to a low mortality. Clearing the secretion from the mouth, nasopharynx and hypopharynx by careful suctioning is recommended. Oxygen and humidity often supplemented with bronchial detergents were used by routine.

Unless there are unusual losses, electrolyte imbalance is not a problem in the post-operative phase. Intravenous fluids were limited to 1.5–2 c.c. per kg. for the first 24 hours, including intravenous fluids given during the operation. The prevention of acidosis in the post-operative period is of the greatest importance. An adequate circulation is the most important single factor in the prevention of this grave complication. However, control of restlessness and high temperatures and the use of intravenous sodium bicarbonate will be of some help.

Post-operative heart failure was treated in the usual manner. Temporary cardiac decompensation that occurs 10–14 days after surgery as the result of the traumatic myocarditis was seen occasionally, especially in patients with low pre-operative cardiac reserve. It is detected early by following daily weights; and it responds well to digitalization and salt restriction and in no way jeopardizes an ultimately good prognosis if properly managed. Antibiotics were given for 14–21 days post-operatively.

#### Post-operative Complications

Chest haemorrhage was excessive in 3 patients and as soon as this complication was detected the patients were taken back to the operating room and the bleeding dealt with. Prompt action with this form of complication is the only form of treatment. The usual blood loss was less than 750 ml.

As coughing and deep breathing are difficult immediately after operation, retention of bronchial secretion became a complication in several cases. In 2 patients direct suction of the bronchi had to be resorted to, but in none of the patients was the performance of a tracheotomy necessary. One patient developed broncho-pneumonia, which responded to the appropriate antibiotics.

Superficial wound sepsis occurred in 2 patients and deeper sepsis in one, but in no instance was there any suggestion of infection of the blood stream, mediastinum, sternum or pleural cavities.

We were fortunate in not encountering heart block of any form in this series.

#### SUMMARY AND CONCLUSION

Our results agree with those of workers in other countries in showing that many congenital cardiac anomalies and some acquired heart lesions can be corrected as a routine surgical procedure with an acceptable low mortality by a well trained team of doctors, nurses and technicians. There is little doubt today that for complex cardiac lesions that were incurable

before the advent of extracorporeal circulation the treatment of choice is open cardiomy with total body perfusion. On the other hand, some difference of opinion may still exist concerning intracardiac conditions in which an improvement in the patients' status was possible by the use of indirect or blind methods of surgical treatment. In this issue the only objective worthy of consideration is the patients' welfare; that is to say, the treatment should be selected which is known to give the best results at the least risk. Considerations such as economic factors, the special equipment or assistance needed, the work thrown upon the blood transfusion service and other personnel, are of secondary importance when human life and happiness are at stake.

In this brief review of our first 30 cases treated by open cardiomy with extracorporeal circulation, the method of correction of certain common congenital defects is discussed in some detail. We should like to emphasize again that in this rapidly expanding field views necessarily change as the result of new experiences. Firm ideas should thus not be held until opinion is crystalized in the light of further knowledge of the problems involved.

#### ADDENDUM

Since the completion of this article another 22 cases were treated by open cardiomy with extracorporeal circulation. Of these cases 2 died. Thus of the 52 (30 + 22) cases treated, 6 died. The 22 cases included complicated clinical conditions such as tetralogy of Fallot, endocardial-cushion defect, rheumatic mitral incompetence, and rheumatic aortic stenosis.

We are indebted to Prof. J. H. Louw, Professor of Surgery at the University of Cape Town, Dr. J. G. Burger, Medical Superintendent of Groote Schuur Hospital, and Dr. J. F. W. Mostert, Medical Superintendent of the Red Cross War Memorial Children's Hospital, for their continued encouragement and support; Dr. V. Schrire and other members of the Cardiac Clinic, Groote Schuur Hospital, not only for referring all these patients to us, but also for their great help in the operating theatre during surgery; Dr. E. R. Rudman, Medical Superintendent of the Western Province Blood Transfusion Service and his staff for their unflinching cooperation; Dr. S. Berman, Head of the Department of Neuropsychiatry and his staff for monitoring and interpreting EEG recordings during operation; Dr. C. S. Jones, Head of the Department of Anaesthesia, Dr. J. Ozinsky and Dr. A. B. Bull; the various surgical registrars and housemen who have 'specialized' these patients; and the Matrons and nursing staff of Groote Schuur Hospital and the Red Cross War Memorial Children's Hospital. To Mr. C. Goosen, Mrs. V. Connell and Miss D. Shephstone, the technical staff of the Department of Surgery, we owe a special debt of gratitude.

To the United States Public Health Department and the Cape Provincial Hospitals Administration, we are greatly indebted, for their financial assistance and their support of the project as a whole, not only ensured the development of the apparatus but also its clinical success.

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## THE UNDERGRADUATE TEACHING OF ANAESTHESIA

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In this country the nature and extent of undergraduate training for the degree of M.B., Ch.B. is largely regulated by rather precise recommendations emanating from the South African Medical and Dental Council, one of whose statutory duties is the supervision of the medical curriculum. In this respect South Africa follows the practice of Great Britain, where the General Medical Council has similar duties.

In February 1947 the General Medical Council of Great Britain added to its list of recommendations concerning instruction in surgery a clause, '(5) A course of theoretical and practical instruction in the administration of anaesthetics'; and the prospectuses of the Examining Board of the Royal Colleges and almost all the Universities reflect this recommendation in their individual prescriptions of the nature and extent of theoretical and practical training in anaesthesia in their medical curricula.

The regulations of the South African Medical and Dental Council that are at present in force require that there shall be special instruction in Anaesthetics and prescribe the following minimum requirements: 'Every student must obtain a certificate that he has personally given 20 general anaesthetics. In addition, he shall receive training in the principles of anaesthesia, including local, spinal, intravenous, rectal and continuous nitrous oxide anaesthesia.' These regulations, however, will be superseded by new regulations which have been adopted by the Medical Council but have yet to be approved by the Minister of Health and gazetted and which, while insisting on instruction in anaesthetics, will not lay down minimum requirements, but will leave the initiative in this matter in the discretion of the universities. The present regulations also prescribe that 'the teaching institution must satisfy itself of the proficiency of the candidates by such certificates of performance or examinations as it deems satisfactory, it being understood that the final examinations may include questions within the scope of these special subjects (which include anaesthetics) in their relationship to medicine, surgery and gynaecology'. When the present regulations are superseded this provision will not be substantially altered.

In May 1957 the General Medical Council (Great Britain) revised its recommendation and erased a very great deal of the detail in its previous recommendations. Specialities and subdivisions of the principal subjects are no longer specified and no attempt is made to indicate precisely the scope of the instruction which should be given in particular branches such as anaesthesia, although a note is appended to the effect that: 'Though instruction in the various specialities in medicine and surgery should be directed in the main to the attainment of sufficient knowledge to ensure familiarity with common conditions, their recognition and treatment, the value of utilizing a speciality to demonstrate general principles should be borne in mind'.

This revision is of particular interest in so far as anaesthesia is concerned, because the structure of the National Health Service and the size and nature of the country make it possible for specialist services to be provided for the bulk of the population as and when they are needed. In consequence there is a body of opinion amongst anaesthetists that maintains that instruction in anaesthesia should be limited to postgraduate students and that anaesthesia should be deleted from the undergraduate curriculum.

## GREAT BRITAIN

*Medical Practice in Great Britain*

The National Health Service has very greatly improved the hospitals and their services to the general public, particularly in the remoter parts of the country. As a result of the improved hospital services and the creation of consultant and specialist-registrar posts, an increasing volume of surgery is being done in peripheral hospitals. One result of this is that the medical schools, particularly those in London, are finding it more and more difficult to ensure an adequate flow of material for undergraduate teaching. Added to this is the attitude that, as the service is entirely paid for by the taxpayer, and as everyone seems to be a taxpayer, the patients are in fact equivalent to private patients and should not be subjected to anaesthetic techniques suitable for students to administer, when more intricate techniques, which can only be used by specialists are available. Although this latter argument is based upon a

false premise, the natural corollary both to it and to the material fact of diminishing teaching material is a diminution in the opportunities for the practical instruction of students in simpler methods of anaesthesia for common surgical operations.

*Present Teaching in Great Britain*

Touching upon the present practice first, I may say that while adhering to the letter of the General Medical Council recommendations of 1947, the institutions I visited in 1958 (11 in England, 1 in Wales, 2 in Scotland and 1 in Northern Ireland) varied very greatly in the extent to which theoretical and practical training in anaesthesia was carried in the medical curriculum.

Thus at the Middlesex Hospital the students receive 4-6 lectures and during their month as surgical dressers in the wards they come with their patients to the operating theatre and may give a few general anaesthetics; while at Guy's Hospital, after 3 lectures in the pre-clinical period, they receive 24 sessions of clinical instruction during a 3-month period largely devoted to anaesthesia. This is followed, in the final 6 months of their studies, by 6 lectures on advanced aspects of anaesthesia. I had an opportunity here of watching a student at work and, in questioning him, found that students may administer as many as 60-80 anaesthetics in their 3 months' period.

Again, the Liverpool students are encouraged to begin practical anaesthetic training when their clinical studies commence. They are required to write up a description of the various anaesthetics they have given, particularly those they do during a 2-week period in their final year which is devoted entirely to anaesthesia. They are then interviewed by the Reader in Anaesthesia and are not allowed to proceed to their final examination unless in his opinion their practical experience has been adequate. At Edinburgh, on the other hand, the classes are so large that it is not possible to give the students more than a smattering of practical training in anaesthesia. But in the last vacation before writing their final examination all Edinburgh students are required to spend 6 weeks at work in a peripheral hospital where, under supervision, they do all the work done by an intern, including anaesthetics, and all such work must be vouched for by the supervising doctors.

At certain centres, such as Leeds, Liverpool, Newcastle and Cardiff, academic departments of anaesthesia have been created. These are very well staffed and housed but most of their energies are directed to postgraduate teaching and research, as is apparent not only from observation at first hand but by studying the work they report in current journals.

As with any other subject, the degree of theoretical and practical training depends not only upon the facilities available, but even more upon the enthusiasm and vigour of the teachers.

*Future Teaching Practice in Great Britain*

The revision by the General Medical Council of its recommendations as to the medical curriculum has not been in effect long enough to bear fruit, but obviously some decision will have to be taken sooner or later on the extent of undergraduate teaching in anaesthesia in the British medical schools. This decision will hinge very largely on whether the aim of medical education at undergraduate level is altered. As the Council points out in its Recommendations of 1957, they '... have always sought in their Recommendations to indicate the minimum standards of instruction and examination which should justify admission to the Register. Until recently it was possible for persons to proceed to independent practice immediately after qualification and registration. The Council's Recommendations, and indeed medical education in general, have therefore emphasized vocational training and experience'.

There is, as I have already mentioned, a body of opinion (rather small and confined chiefly to London) which holds that all anaesthetics should be given by consultant anaesthetists or at least by registrars who aspire to consultant status. However, local geography, the English weather and the British character combine to make it necessary, even today, for general practitioners to administer anaesthetics. The nearest hospital may only be 17 miles away, but in winter the roads may be blocked by snow and, even when the weather is kind, such a distance, to an English countryman, is equivalent to at least 170 South African miles. He must go to a

town which may be completely strange to him. His relations will not be able to accompany him, or even visit him with any regularity, and he is therefore loath to seek specialist attention unless it is forced upon him by the gravity of his condition. Should he succumb, the survivors in his community will then be even less willing to take the risk. When this point of view was put to me, by laymen, I was reminded strongly of Pauline Smith's story 'The pain' in *The Little Karroo*. For minor surgery, the patient turns to his general practitioner, and one of these, who was attending a refresher course at Cardiff, told me that although a consultant anaesthetist visits his local hospital 2 or 3 times a week, he himself still gives 6 or 7 anaesthetics each week. Another participant confirmed this, and Dr. John Gillies at Edinburgh reports that the position is similar in Scotland.

Dr. Frankis Evans, Dean of the Faculty of Anaesthetists of the Royal College of Surgeons (England), while admitting that his Faculty had not yet given a lead in undergraduate teaching, expressed the opinion that it must soon do so, since it would be economically and ethically impossible to insist that all anaesthetics in Great Britain be administered by specialists. This view appears to be held by the majority of anaesthetists in teaching hospitals, the notable exceptions being Prof. Sir Robert Macintosh at Oxford and the late Dr. Bernard Johnson at the Middlesex, both of whom would exclude anaesthesia from the undergraduate curriculum. The vast majority of British anaesthetists are in favour of continuing, and even expanding, the undergraduate teaching of anaesthesia.

Most noteworthy, perhaps, is the reason advanced for continuing to teach anaesthesia at the undergraduate level. Practically without exception, those who insist on retaining anaesthesia in the curriculum do so, not in order to teach anaesthetic techniques so that patients may be anaesthetized for surgery, but in order to teach the principles of the care of the unconscious patient. Since this embraces patients unconscious from head injuries, cerebrovascular accidents, infections such as tetanus and poliomyelitis, and metabolic disturbances such as diabetes, it may truthfully be said that the reasons for teaching anaesthesia have moved from surgical to medical grounds.

Two other reasons are advanced for maintaining undergraduate teaching of anaesthesia. Firstly, the subject offers an opportunity for the visible practice of the basic sciences and the integration of these basic sciences with the clinical subjects. Here it falls most aptly into line with the note of the General Medical Council Recommendations quoted earlier. Secondly, if anaesthesia is to become largely a specialist practice based upon postgraduate training, it still remains necessary to expose the largest possible medical population to it, in order to attract recruits. This can be done most conveniently at undergraduate level.

#### SOUTH AFRICA

##### Present Teaching in South Africa

As noted earlier, minimum requirements are set down by the Medical and Dental Council. These minima may be exceeded, as for example at Pretoria, where students attend a lecture in anaesthetics every week throughout their 5th-year study; or may be paid lip service only, as was apparent from comments made in reply to a questionnaire submitted to medical practitioners. Many of these indicated that they were given credit for personally administering an anaesthetic under supervision when in fact they had done nothing more than watch, and that not for the entire duration of the anaesthetic.

Towards the end of 1958 the Council decided that interns should be required personally to administer 50 anaesthetics under supervision before they were admitted to the register; but this step falls as much into the field of postgraduate as undergraduate training and its implications need not concern us here.

##### Future Undergraduate Teaching of Anaesthesia in South Africa

Since the General Medical Council and the South African Medical and Dental Council have both adopted new provisions (those of the South African body still to be promulgated) which leave the requirements in anaesthetics in the medical curriculum to the initiative of the individual examining bodies (although in South Africa instruction will be obligatory), it is important at this time to try and formulate plans which may assist the universities in framing rules for the teaching of anaesthesia.

Future teaching, if any, in South Africa should logically be based upon the requirements of medical practice in this country.

The reasons advanced in Great Britain for retaining anaesthesia in the medical curriculum (care of the unconscious patient; integrated practical use of basic sciences; recruitment for the speciality) are equally valid in South Africa.

At present the aim of the regulations of our Medical Council is to produce a medical practitioner capable of independent practice as a general practitioner after registration.

I have shown in another report that of more than 380,000 anaesthetics administered in South Africa in 1957, at least 250,000 were administered by non-specialists. It is therefore apparent that the need for capable general-practitioner anaesthetists is far greater than it is in Great Britain and will continue to be so for many years.

It is true that at any one time only about 1/5th of the total medical population (excluding specialists) will give anaesthetics, and it is possible to argue that to insist on all medical students studying anaesthesia will be to waste the time of 4/5ths of them. However, probably at least 4/5ths of the total medical population have given anaesthetics at some time or another, and soon, by virtue of the new rule cited above, all medical graduates will be required to give anaesthetics during their internship period.

There is little doubt that the subject of Anaesthesia must remain in the medical curriculum unless a drastic alteration takes place in present medical opinion. The geographical and economic factors in South Africa do not favour any alteration at present. If this is accepted the next decisions to take are: (1) What should the nature of the teaching be? (2) When should it be given? (3) To what extent should it be given?

#### THE PROBLEM

In an attempt to suit the answers to these questions to conditions in South Africa, members of the profession were questioned on what alterations or improvements they would suggest in the undergraduate teaching of anaesthesia. 414 medical practitioners submitted comment in reply to the invitation.

##### What should be taught?

There will, I think, be general agreement with the suggestion made by the General Medical Council that instruction in specialities, including anaesthesia, '... should be directed in the main to the attainment of sufficient knowledge to ensure familiarity with common conditions, their recognition and treatment', and that recognition should be accorded to '... the value of utilizing a speciality to demonstrate general principles'. I think too, that the value of anaesthesia in teaching the care of the unconscious patient, from whatever cause his unconsciousness stems, will be acknowledged. But it is evident from the survey of anaesthetic practice (see Table I) that much more must be taught, and it is instructive

TABLE I. SUGGESTIONS ON UNDERGRADUATE TRAINING IN ANAESTHESIA

	Number Commenting	% of Replies
Replies to questions .. .. .	414	100.0
<i>Subject of Comment</i>		
Practical training .. .. .	262	63.2
Theoretical training .. .. .	85	20.5
Anaesthetic machines .. .. .	41	9.9
Muscle relaxants .. .. .	45	10.9
Local anaesthesia .. .. .	91	22.0
Endotracheal intubation .. .. .	55	13.3
Intravenous anaesthesia .. .. .	35	8.5
Obstetrical anaesthesia .. .. .	9	2.2
Intravenous therapy .. .. .	4	1.0
Compulsory intern training .. .. .	36	8.7
Open ether and chloroform .. .. .	74	17.9
<i>Date of graduation of 74 practitioners advocating training in open ether and chloroform</i>		
Before 1940 .. .. .	15	20.3
1940-49 .. .. .	21	28.3
1950-55 .. .. .	38	51.4

to note that 63% of those commenting on undergraduate teaching stressed the need for more and better practical training and experience. Apparently the theoretical training is fairly adequate, for only 20% commented on this and few of these asked for more lectures.

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Of those commenting, 22% emphasized the need for adequate instruction in the use of local anaesthetic techniques, particularly for simple dentistry.

Rather remarkably, 18% asked for more and better practical instruction in 'rag and bottle' techniques for open chloroform and open ether anaesthesia. This is obviously related to conditions of practice, particularly in the towns, for 51% of those asking for this type of training had qualified in the 6 years immediately preceding the year (1957) in which information was sought, so that it was the recent graduate, not the old-timer, who recognized the value of these simple techniques. Very few commented on the more complex techniques available in anaesthesia and it would apparently be a reasonable generalization to say that what is needed by the general practitioner is training, specifically practical training, in local anaesthetic and simple inhalational anaesthetic techniques.

#### *When should this be taught?*

The basic subjects are basic to anaesthesia as well as to the main streams of medical knowledge. This applies particularly to physics and chemistry, physiology, anatomy and pharmacology. Anaesthesia can supply examples of the application of knowledge in each of these fields and, being a practical art rather than an abstract elucidation of diagnostic problems, is well suited for clinical demonstrations at an early period in the medical curriculum.

It is entirely feasible, and perhaps theoretically most reasonable, to give academic instruction in anaesthesia as early as the third year of study, when the subject could be presented as practical pharmacology. This has been suggested by Dr. Bryce Smith of Oxford, on the basis of his experiences in the USA and Great Britain, and appears to be a step which could easily and profitably be made the basis of an experiment without any upheaval in the present curriculum.

The problem of providing more and better practical instruction is not insuperable but, since constant practice at discreet intervals is far better than concentrated practice over a short period followed by complete neglect, it would appear best to try and provide fairly regular experience over as long a period as possible. Ideally, perhaps, such practical experience might cover all three clinical years, and could do so without encroaching upon the ordinary curriculum in those years.

As an illustration, if there are 100 students in each clinical year there will be 300 students requiring some practical training in any given year. In an ordinary general teaching hospital 60% of anaesthetics are for minor surgery and, if each student administered 10 anaesthetics in a year (or one a month), only 3,000 anaesthetics would be required to provide the necessary student instruction. Since it is a poor general hospital which does less than 10,000 anaesthetics per annum, there will be ample material for the students.

As the anaesthetics are for minor surgery and usually of short duration, a student would not need to spend more than an average of one hour per month to achieve regular contact with the care and treatment of unconscious patients, and practise simple methods of rendering them unconscious.

The creation of special operating sessions to cater for minor surgery gathered from various other sessions (where such surgery is often a nuisance) would make practical training in anaesthesia much simpler, since little time would be wasted by students in waiting for larger, major and (for a student) unsuitable cases to be disposed of.

#### *To what extent should teaching be carried?*

As it takes at least 3 years of single-minded application to anaesthesia to achieve reasonable skill and proficiency (*vide* Medical Council Rules for specializing) it is obviously impossible to try and produce a general practitioner who is skilled as an anaesthetist. But to ensure familiarity with common techniques is another matter and one that can be more easily achieved—too easily, perhaps, since familiarity, notoriously, does not always go hand in hand with respect which only great experience instils.

Our own medical practitioners have emphasized that practical experience in local anaesthetic techniques for simple surgery, and simple anaesthetic techniques for more complex surgery, are really all that is required. Only 13% of those commenting thought that endotracheal techniques should be taught. Only 10% asked for training in the use of anaesthetic machines and 10% for training in the use of muscle relaxants.

The answers showed that in one year 30% of those replying did not give any anaesthetics for major surgery, 39% gave between 1 and 50 anaesthetics for major surgery, and the remaining 30% gave between 50 and 250 anaesthetics for major surgery. In contrast, 82% of those replying used local anaesthesia, while local anaesthetic techniques made up 40% of the non-specialist anaesthetic practice in 1957.

If those practitioners who are frequently engaged in giving anaesthetics find that they do not need any detailed training in complex techniques, it is obviously not necessary to provide such training—with this reservation that the absence of comment on the need for instruction in more complex techniques may stem from the fact that such techniques have been adequately taught in the first place. An analysis of the type of surgery undertaken in teaching hospitals suggests that, if complicated techniques are being well taught, they are being used for minor surgery which can be handled as well with much simpler techniques. This, of course, returns us to the false premise I mentioned earlier under the heading 'Medical Practice in Great Britain'.

#### *Examinations*

The decision whether to examine the students in anaesthesia or not does not fall within the orbit of my enquiry. I should, however, like to point out that examinations serve 2 purposes. In addition to testing the ability of the students, examinations also test the ability of teachers. This leads back to the point, emphasized earlier, that the degree, and quality, of theoretical training depends upon the enthusiasm and vigour of the teachers.

#### *Undergraduate Teaching Elsewhere*

Until 1945 very little advance had been made in the practice of anaesthesia on the continent of Europe and it was not until that year also that anaesthesia as a medical speciality became prominent in the USA. Even today 20% of anaesthetics administered in the USA are given by nurses, and it has been calculated that all the graduates from the medical schools in the USA for the next 7 years would have to specialize in anaesthesia if every anaesthetic in that country had to be given by a specialist. To achieve the same level in the Union would take all the graduates of all our medical schools 4 years.

Nothing like the same degree of specialization has taken place on the Continent.

Because South African medical practice is based four-square on British custom, and because a study of Continental, Canadian and American undergraduate teaching in anaesthesia would be altogether too expensive of time and money, no attempt has been made to compare our own teaching with that in the countries listed.

#### *Epilogue*

The example of the development of anaesthesia in the USA is one which could profitably be followed by less developed areas of Africa. In the USA the economic development of the country allowed the nurse anaesthetist to be displaced by better trained but more expensive physician anaesthetists. The nurse anaesthetists did a magnificent job and it is common cause that a nurse constantly practising one or two techniques is usually much safer as an anaesthetist than the general practitioner who gives only 6 or 7 anaesthetics a month. It appears logical, therefore, in countries such as the Protectorates and the Federation of Rhodesia and Nyasaland to use specially trained African anaesthetic technicians, supervised constantly by a specialist anaesthetist, in order to provide a good and relatively cheap service for African patients. There is little doubt that the African population, even in South Africa, presents a tremendous reservoir of major and minor surgical conditions which has been barely touched. But to insist on specialist anaesthetic services at this stage would make the provision of reasonable surgical services quite uneconomic.

If African anaesthetic technicians are introduced, they will in the natural order of things, be displaced by specialist anaesthetists of their own kind when the African medical population has expanded sufficiently to provide them, and the African economy has expanded sufficiently to support them. This interesting facet of anaesthetic training is included here because I feel I ought to touch upon it, and because the training of such African anaesthetic technicians should be on a par with, but over a longer period and with greater intensity than, the training of medical students.

# THE RELATIONSHIP BETWEEN SERUM PROTEIN-BOUND IODINE AND INTELLIGENCE IN A GROUP OF BANTU FROM PORTUGUESE EAST AFRICA

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It is well known that there is a relationship between intelligence and the thyroid hormone. In cretinism, where there is marked retardation of physical and mental growth, and in myxoedema, in which mental dullness, lethargy and poorness of memory occur, thyroid therapy is used with excellent results. The purpose of the present investigation is to determine the magnitude of the correlation which might exist between thyroid activity and intelligence in a group of Bantu.

## Subjects and Methods

This study was carried out on 63 subjects, i.e. 28 Shangaans, 18 Chopi, 13 Nyembane and 4 Tonga, between 17 and 22 years old. All were new arrivals at Durban Roodepoort Deep Mine from Portuguese East Africa. They were illiterate and had no previous mining experience. They were medically examined and declared fit for underground duty. Clinically, there was no obvious abnormality of the thyroid gland. The following determinations were carried out.

1. Serum protein-bound iodine, estimated by the method of Leffler.<sup>1</sup> This estimation gives an index of the concentration of thyroxine in the peripheral blood. It is a specific test particularly sensitive for the measurement of hypofunction of the thyroid gland.

2. A battery of psychological tests designed to measure intelligence, developed by the National Institute for Personnel Research for the occupational classification of African mine workers.<sup>2</sup> These tests were as follows: (a) Sorting test 1, (b) sorting test 2, (c) cube test, and (d) tripod test. These tests are widely used on the mines and do not depend on language for their administration. They have been found to be reliable by the split-half method.<sup>3</sup> Performance on the total test battery (4 tests) is measured in terms of Dudec. Dudec is a scale with 12 intervals. In this context it represents a range of performance on a psychological test battery from superior (Dudec 1) to inferior (Dudec 12). The serum protein-bound iodine estimations and intelligence tests were carried out independently; and only when completed were results compared.

## Results

The findings are shown in the following table:

SERUM PROTEIN-BOUND IODINE VALUES AND DUDEC RESULTS IN 63 BANTU

	Mean	S.D.	Range
Serum protein-bound iodine, $\mu\text{g}/100\text{ml.}$	5.2	1.1	1.8—8.0
Dudec	6.9	1.8	2—11

The two low serum protein-bound iodine results found (1.8 and 2.3 micrograms per 100 ml.) were corroborated by repeat estimation.

Analysis of the serum protein-bound iodine figures and standard test battery scores for the total sample shows that there were no significant differences at the .05 level.

The mental level of these subjects was tested at Dudec 8 and 7 respectively. (In any group of 100 African mine workers 69 would be expected to possess mental ability superior to those whose test performance lay at Dudec 8. Similarly, 50 cases in 100 would be expected to possess mental ability superior to those scoring Dudec 7.)

## Discussion

The results show that there is no correlation between the serum protein-bound iodine level and the intelligence of the subject as measured by the test battery. A low level of serum protein-bound iodine does not correlate with a low level of mental ability.

In the sample of 63 Africans only 2 had low serum protein-bound iodine values (normal values: 2.5—8.0  $\mu\text{g}/100\text{ml.}$ ). Psychological tests classified them as average or slightly below for intelligence (the average normal Dudecs are 6 and 7).

These low serum protein-bound iodine values are of considerable interest, particularly as similar results have been observed before (1.0, 1.8, 2.2 and 2.3  $\mu\text{g}/100\text{ml.}$ ).<sup>3</sup> Such low values in the White would immediately suggest myxoedema or endocrine imbalance, and physical and mental signs and symptoms would undoubtedly be present. However, in the Bantu with very low serum protein-bound iodine levels there is no clinical evidence of hypothyroidism or diminished intelligence. It is suggested that there may be a direct relationship between iodine deficiency in their food and low serum protein-bound iodine levels. This is in agreement with Politzer and Anderson's previous study.<sup>3</sup>

It is proposed to carry out further research into the occasional low protein-bound values and their possible causes.

## Summary

1. Serum protein-bound iodine estimations and a battery of psychological tests were carried out on 63 Portuguese East African Bantu in order to ascertain whether there was a relationship between thyroid activity and intelligence.

2. The results did not support this hypothesis.

We wish to express our thanks to Mr. D. J. van Druten for the protein-bound iodine determinations and to Dr. L. E. Miller and Mr. M. F. L. Boer, from the Durban Roodepoort Deep Mine, for their assistance.

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2. Biesheuvel, S. (1952): *S. Afr. J. Sci.*, **49**, 3.
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**42ND MEDICAL CONGRESS (M.A.S.A.), EAST LONDON, 27 SEPTEMBER—3 OCTOBER 1959**  
**42STE MEDIESE KONGRES (M.V.S.A.), OOS-LONDEN, 27 SEPTEMBER—3 OKTOBER 1959**

**SCIENTIFIC AND TRADES EXHIBITION**

Following are details of the products to be featured by some of the pharmaceutical firms participating in the Exhibition at Congress:

**Pfizer Laboratories South Africa (Pty.) Ltd. (Stand No. 10)**

*Terramycin* in a wide range of dosage forms, as well as the firmly established potentiated antibiotic *Sigmamycin*, a combination of oleandomycin and tetracycline.

A full range of Pfizer corticosteroids, among which is included the new *Cortril Aerosol Spray* and *Delta Cortril Enteric*, the steroid that reduces gastric irritation which so often accompanies steroid therapy.

*Diabinese*, a new oral hypoglycaemic agent, which as the result of extensive clinical trials has received world-wide acceptance.

*Tyzine* for immediate nasal relief without rebound action and which is also highly effective for ophthalmic use.

C. H. Boehringer. Pfizer will feature, on behalf of Messrs. C. H. Boehringer, the newest in effective spasmolytics, *Buscopan*, together with the new contact laxative, *Dulcolax*. *Catovit* will be available for the first time in South Africa. Another well-known product will be *Sulfa-Perlongit* the sulphonamide sustained-release suspension for oral administration. The highly effective *Preludin* will also be featured.

**Reckitt & Colman (Africa) Ltd. (Stand No. 43)**

*Tridis*, a new analgesic which is a combination of aspirin, phenacetin and caffeine with the aspirin solubilized. This addition to the *Disprin-Codis* range has already been introduced in the UK, where it is known as *Cafdis*.

*Film strips*. Of particular interest will be an illuminated set of film strips produced in teaching hospitals for instructional purposes under the sponsorship of Messrs. Reckitt & Colman and their representatives will be glad to give details of their library of more than 20 different subjects.

**Petersen Limited. (Stand No. 37)**

*Arcofac* (Armour Pharmaceutical Co. Ltd.), Armour cholesterol-lowering factor.

*Tryptar Ointment* (Armour Pharmaceutical Co. Ltd.) containing 2 enzymes and 2 antibiotics.

*Disipal* (Brocades-Stheeman & Pharmacia), which abolishes Parkinson rigor and also muscular rigidity and muscular spasms of other origin. The psychotropic action of *Disipal* is important in psychasthenia.

*Cyclospasmol* (Brocades-Stheeman & Pharmacia), a spasmolytic agent for the treatment of peripheral vascular diseases.

*Damagal* (Siegfried Ltd.), which is a preparation of digestive enzymes indicated in all cases of intestinal disorders deriving from an insufficiency of the digestive glands.

*Phosellite B & C* (Siegfried Ltd.), a Roborant-stimulant which aids convalescence and increases capacity during intensive claims on energy.

Petersen Limited will also feature *London Hospital Catgut* and the ethical products of Ward, Blenkinsop & Co. Ltd., London, and The Crookes Laboratories Ltd., London.

**FBA Pharmaceuticals (S.A.) (Pty.) Ltd. (Stand No. 28)**

Formerly Channel Drugs (Pty.) Ltd.

*Detigon*, a powerful antitussive known to be better than codeine because it is free from side-effects. *Detigon* enables patients, even with severe pulmonary lesions, to obtain unbroken sleep. *Detigon* is not habit-forming, and is the ideal pacifier for those with bronchitis or tuberculosis. *Detigon* is supplied in drop bottles and a dose of 15 drops 3 times a day is sufficient to control the most irritating coughs.

*E 39*, a cytostatic which is specific in chronic leukaemia and Hodgkin's disease. In other types of cancer it produces long-lasting remissions. It is of great value if used both before and after operation. Treatment is at first intravenous, followed by an unbroken course of tablets.

*Elestol*, a combination of 3 antirheumatic drugs, namely

resochin, prednisone and aspirin. It is being successfully used in the treatment of rheumatoid arthritis, painful shoulder and myalgias generally. *Elestol* is the ideal supportive in the modern attack on rheumatoid arthritis using MAO inhibitors.

*Gresuton* is a geriatric remedy containing the circulatory hormone kallikrein, reserpine, theophylline and vitamins A, E, B<sub>1</sub> and B<sub>12</sub>. *Gresuton* produces an improved circulation and an almost immediate feeling of well-being. It eliminates excess tiredness, dizziness, confusional states and slow-healing lesions. One or 2 capsules daily brightens the outlook of most aged persons.

*Glumorin* contains the circulatory hormone kallikrein, whose most important property is the dilation of peripheral blood vessels. *Glumorin* has been used successfully in the treatment of indolent leg ulcers and poorly healing wounds generally, and is also valuable in the treatment of frostbite. *Glumorin* is supplied as tablets and ampoules. *Depot-Glumorin* is the slowly absorbed form to be used intramuscularly.

**Squibb Laboratories (Pty.) Ltd. (Stand No. 24)**

*Rautrax* provides, in a single tablet, a wider-range therapy for a wider range of hypertensive patients. It is a combination of flumethiazide, whole-root *Rauwolfia serpentina* and potassium chloride. Flumethiazide is a new diuretic-antihypertensive which often is effective in patients refractory to chlorothiazide—less potassium loss has been reported with it than with chlorothiazide and hydrochlorothiazide. *Raudixin*, the cornerstone of anti-hypertensive therapy, has a gentle sustained action as well as a bradycardiac effect. Its tranquillizing activity helps to relieve the anxiety common to hypertensive patients. The combination of flumethiazide and *Raudixin* permits smaller doses of each agent, reducing the possibility of unwanted effects. Potassium chloride is added for additional protection against potassium and chloride loss in long-term therapy. *Rautrax* is supplied in capsule-shaped tablets containing 50 mg. *Raudixin*, 400 mg. flumethiazide and 400 mg. potassium chloride in bottles of 25 tablets.

*Siquil*, a new and improved phenothiazide compound (trifluoromazine)—a remarkably safe drug for treating the agitated patient. It is more potent and easier to handle than chlorpromazine. *Siquil* appears to have a direct effect on emetic centres and the gag reflex. It is more rapidly effective than chlorpromazine and frequently will halt nausea and vomiting unresponsive to standard anti-emetics and other phenothiazine drugs. For this reason *Siquil* is a valuable drug for both pre- and post-operative use. In the alcohol-withdrawal syndrome *Siquil* is as effective as chlorpromazine with half the dose; rapidly relieves psychomotor agitation, insomnia, anorexia, depression and hostility associated with the withdrawal phase of alcoholism. Its blocking effect on emetic centres is an added therapeutic bonus for the patient unable to retain foods or liquids. Unlike other phenothiazide derivatives, it does not over-sedate or over-excite; no jaundice, liver damage or convulsions have been associated with its use. Skin eruptions, photosensitivity and hyperthermia are rare. *Siquil* is supplied in tablets of 10, 25 and 50 mg. in bottles of 50 and 500; in an emulsion of 10 mg./c.c. in 30 c.c. dropper bottles, and for injection 20 mg./c.c. in 5 × 1 c.c. (multidose vial) boxes.

*Kenacort-A*, an effective topical steroid—providing unexcelled safety and clinical superiority. *Kenacort-A* (triamcinolone acetate) has marked anti-inflammatory anti-pruritic and anti-allergic effects. It is supplied as *Kenacort-A Ointment* in 5 g. tubes; and as *Kenacort-A Lotion* with *Graneodin* (Squibb Neomycin + Gramicidin) in 15 c.c. plastic squeeze bottles.

In addition a number of *Audio Digest* tape recordings, together with facilities for doctors to listen to the tapes, will be available. These will consist of 2 tape recorders with six sets of ear-phones.

**Maybaker (S.A.) (Pty.) Ltd. (Stand No. 21)**

*Perolysen* brand pempidine tartrate for the safer and more convenient management of hypertension.

*Penitriad* brand tri-sulphonamide/penicillin VK for the treatment of infections due to organisms sensitive to penicillin and sulphonamides.

*Streptotriad* brand tri-sulphonamide/streptomycin for the comprehensive treatment of bacillary dysentery.

*Otamidyl* brand ear drops for the treatment of otitis externa and chronic suppurative otitis media.

*Diaginal* viscous brand sodium acetazote 40% w/v in dextran solution for hysterosalpingography.

*Planidets* brand antiseptic lozenges for painful throat and mouth infections.

*Penivikal* brand potassium penicillin V tablets for the treatment of infections due to penicillin-sensitive organisms.

*Vallergan* brand trimeprazine tartrate for use as an oral antipruritic and sedative in dermatology and general medicine.

#### Dowson & Dobson Ltd. (Stand No. 51)

*Blood pH Meter*—an instrument specially developed for measuring the pH of blood and other biological fluids. A special sealed glass pH electrode has been developed for measuring the pH of small amounts of blood (about 0.5 ml) by Dr. Victor Wynn, Senior Lecturer in Surgery at St. Mary's Hospital in London, and as the equipment is designed for continuous operation, there is only a delay of approximately 5 minutes between blood reaching the laboratory and measurement of its pH. The standard deviation for the re-producibility of this pH measurement is 0.005 pH units, which is well within the limits necessary for clinical work. The use of this instrument in measuring the pH of blood is described in an article published in the *Lancet* of 25 May 1957 and reprints of this article will be available at the exhibit.

*Bristol Bloodbank Recording Thermometer*, which is widely used in bloodbank installations in Southern Africa, and is invaluable in determining whether the blood stored is, in fact, fit for transfusion. A bloodbank refrigerator not equipped with a bloodbank recording thermometer may go off during the night or at other times because of power failure, and although power may be restored, the blood may have become warm. The blood is then re-cooled and the haemolysis which occurs when the red cells are brought to body temperature at the time of transfusion may not be detected unless a sample is centrifuged. Severe haemolytic reactions may, therefore, result if this condition is not detected. The instrument on show is a recorder only, but bloodbank recorders are available with audible alarm systems which operate in the event of the temperature deviating from the safe range.

#### Vernleigh Products (Pty.) Ltd. (Stand No. 27)

*Catron*, which has been tested over the last 2 years, has just been released by Lakeside Laboratories of Milwaukee, Wisconsin, USA. *Catron* (a monamine oxidase inhibitor) is a psychotropic hydrazine, a psychic energizer and a valuable psychotherapeutic agent. *Catron* acts rapidly and is lasting. It is indicated in severe regression, depression of the aged, uncooperativeness, irritability, irritability, loss of appetite, lack of ambition, hopelessness, and schizophrenia. *Catron* elevates mood, increases alertness and ability to maintain work and social adjustment. The usual dosage is 12 mg. once daily for 2 weeks, which is then reduced to 6 mg. and ultimately 3 mg. For hypertension the dose is 12 mg. daily, for angina pectoris 3 mg. daily, for rheumatoid arthritis 12 mg. daily reduced as improvement occurs. *Catron* is supplied in tablets of 3 mg. and 6 mg.

*Bellavern Tablets*, an antispasmodic sedative, containing the 3 belladonna alkaloids in optimal proportions with phenobarbitone. *Bellavern* is used in all hypertonic and spastic states and has readily been accepted as the ideal treatment of motion sickness.

*Cordilate Tablets* are made in 10 mg. and 30 mg. sizes, and are the Vernleigh brand of penta-erythritol-tetranitrate, which gives prolonged coronary vasodilation. Each dose provides approximately 6 hours of protection from attacks.

*Rauwopur Tablets* contain a delicately balanced mixture of reserpine with 4 other of the alkaloids of *Rauwolfia serpentina*. The reduction in blood pressure is much more marked and lasting than that produced by reserpine alone; the action is not over-sedative and is highly suited for ambulant cases. *Rauwopur* is excellent for the treatment of essential hypertension.

*Vernthol* is a flavoured solution of theophylline in dilute alcohol, in which form the theophylline does not exhibit its usual gastric side-effects. *Vernthol* is able to quell an acute asthmatic attack in a very few minutes, as it gives high blood-levels with a minimum of delay. General toleration of *Vernthol* has been proved even

when the quantity of theophylline taken is 3 times that acceptable in tablet form.

*Dactil*, *Piptal*, *Cantil* and *Tridal* are all piperidols from the impressive Lakeside range of antispasmodics. *Dactil* is specific for pain and spasm of the upper gastro-intestinal tract and is very fast acting. *Piptal* is selective for gastric and duodenal spasm, and is widely accepted as the world's leading anticholinergic. *Cantil* is also highly selective, its action being almost entirely restricted to the colon. *Tridal* is a mixture of *Dactil* and *Piptal*. It has spasmolytic action throughout the gastro-intestinal tract and corrects hypersecretion and hypermotility. Paediatric *Piptal* is *Piptal* with phenobarb supplied as a pleasantly flavoured liquid in 15 and 30 c.c. vials, for the treatment of infant colic, etc.

*Caytine*, a Lakeside preparation, is probably the most effective bronchodilator known at the present time. *Caytine* is a derivative of adrenalin and its bronchodilating effect is considerable and prolonged. In the worst crises it is given as an injection which produces immediate relief, treatment being continued with *Caytine* tablets. It is being reported that *Caytine* acts dramatically in emphysema complicated with asthma.

*Gastrotest*, a Cilag preparation, allows the estimation of stomach pH without siphonage. A certain pyridine-azo-dye is taken into the stomach in tablet form and, after a short interval the stomach acidity is read, by means of a chart, from the colour of the urine.

*Isolevin*, another Cilag preparation, is the laevo-rotatory isomer obtained by the resolution of isopropyl-nor-adrenalin. A few deep breaths of the spray will terminate an acute asthmatic attack, and a few sublingual tablets during the day will usually keep the patient free from further attacks.

*Lyspafene*, a Cilag preparation, is a smooth-muscle spasmolytic, specially active in colic or spasm of the urinary tract. Supplied in both tablet and injection forms.

*Lyspafene Compound* is a combination of *Lyspafene* with the tried and proven analgesic nor-amidopyrin-methanesulphonate. The results of treatment with this drug in cases where it is demanded by the intensity of the pain, are impressive.

#### Parke, Davis Laboratories (Pty.) Ltd. (Stand No. 1)

*Chloromycetin Succinate*, the mono-sodium succinate ester of chloramphenicol, represents a revolutionary advance in parenteral broad-spectrum antibiotic therapy in that it may be used either intravenously, intramuscularly or subcutaneously. It is highly soluble in aqueous media and parenteral fluids, easily prepared for use, and produces minimal tissue reaction. *Chloromycetin Succinate* is rapidly hydrolyzed by the tissue enzymes, producing effective therapeutic concentrations of free and active chloromycetin throughout the system.

*Humevac*, another new preparation, is a faecal softener indicated in the many conditions where soft stools or prevention of constipation is required. The active ingredient of *Humevac* is a polymer of ethylene oxide and propylene oxide, which acts as a surface tension depressant, permitting water to penetrate into, and soften, dehydrated faecal material. *Humevac Capsules* are completely stable, non-toxic, tasteless and odourless.

*Chloromycetin Hydrocortisone Ophthalmic Ointment*, a recent addition to the established *Chloromycetin* eye range, for the treatment of a wide range of *Chloromycetin*-sensitive eye infections, and where hydrocortisone may also be required.

Also featured at the Parke, Davis exhibit is their extensive range of anticonvulsants—*Epanutin*, *Epanutin & Phenobarbitone*, *Milontin* and *Celontin*. *Celontin*, the latest member of this group is already established in the treatment of psychomotor and mixed types of epilepsy.

#### SKF Laboratories (Pty.) Ltd. (Stand No. 19)

*Stelazine* brand trifluoperazine, which is a versatile phenothiazine used in general practice in low doses for mild mental and emotional disturbances and in mental hospitals in high doses for severe psychotic conditions, especially schizophrenia. *Stelazine* is also a potent anti-emetic indicated especially in the nausea and vomiting of pregnancy.

*Tyrimide* brand isopropamide, an inherently long-acting anticholinergic. One dose in the morning and one at night provides continuous antisecretory and antispasmodic action.

*Furoxone* brand furazolidone, which is a therapeutic specific for enteritis and dysentery, notably for an absence of cross-

resistance with often within

To the ra ducts such as capsules, has diphenylpyra the symptom sole product introduced for Furadantin one of the n products with antibacterial

J. R. Geigy, Pharmacists

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resistance with antibiotics. It affords rapid relief of symptoms—often within 8 hours.

To the range of well-known *Spansule* sustained-release products such as *Dexedrine Spansule* capsules and *Drinamyl Spansule* capsules, has been added *Histril Spansule* capsules containing diphenylpyraline, an antihistamine giving 12-hour relief from the symptoms of hay fever and allergies. A new long-acting spansule product *Phenobarbitone Spansule* capsules has just been introduced for 12-hour sedation and the control of epilepsy.

*Furadantin brand nitrofurantoin* is still acknowledged to be one of the most successful and safest broad-spectrum nitrofurantoin products with no cross-resistance with antibiotics in the urinary antibacterial field.

**J. R. Geigy, S.A. (Pty.) Ltd. (Stand No. 35.)**  
**Pharmakers (Pty.) Ltd.**

*Butazolidin* an antirheumatic and anti-inflammatory agent. *Butazolidin* is characterized by the following properties: Wide range of action, potent anti-inflammatory effect, pronounced analgesic and antipyretic properties, rapid action, constant efficacy with low maintenance-doses, especial suitability for long-term treatment of chronic conditions, and no disturbance of hormonal secretion, even on long administration.

*Irgapyrin*, an antirheumatic, analgesic, anti-inflammatory antipyretic. *Irgapyrin* is characterized by the following properties: Composite anti-inflammatory, analgesic and antipyretic action, rapid anti-inflammatory and analgesic effect in rheumatic disorders, reliable inhibition of exudation in acute inflammatory conditions, local and systemic activity, wide field of indication, and flexible dosage with various pharmaceutical forms.

*Dosulfin*, a composite low-dosage sulphonamide preparation. *Dosulfin* has the following advantages: Wide range of indications, polyvalency against infections, extensive distribution in the body, protection against metastases of infection, low initial and maintenance dosages, low individual doses, rapid and prolonged action, long intervals between doses, no night-time dose, and pleasant dosage-form for children: syrup (with measure). It is indicated for sulphonamide-susceptible infections of a wide range of organs.

*Eurax*, an antipruritic acaricide. *Eurax* is characterized by the following properties: Specific antipruritic action, effectiveness in symptomatic and essential pruritus—not a local anaesthetic, not an antihistamine—bacteriostatic, acaricidal and pediculicidal properties, prevention of secondary infections, rapid action, long-lasting effect, notable freedom from toxic, sensitizing or irritating properties, and cosmetic acceptability: non-staining and non-odorous.

*Sterosan*, for the topical treatment of bacterial and mycotic skin-diseases. *Sterosan* displays both potent antibacterial and antimycotic properties. It can thus be used for the majority of pyogenic and mycotic skin diseases, particularly athletes' foot and ringworm where the combined antibacterial and antimycotic properties are the perfect answer to successfully combating these two conditions, especially bearing in mind that secondary infection is usually associated with either athletes' foot or ringworm.

## IN DIE VERBYGAAN : PASSING EVENTS

**Dr. T. G. Armstrong**, of Durban, will return on 5 October from an overseas postgraduate study tour. Dr. Armstrong spent from April to June of this year at the Cardiac Clinic, Groote Schuur Hospital, Observatory, Cape, before proceeding to the UK for 3 month's postgraduate study of heart diseases, with particular reference to the surgery of heart disease.

**South African Institute for Medical Research, Johannesburg, Staff Scientific Meeting.** A meeting will be held at 5.10 p.m. in the Institute Lecture Theatre on Monday 28 September when Miss G. Macnab will lecture on 'The properdin system'. Tea will be served and visitors will be welcome.

**Drs. R. J. Tahan and G. C. Borggreve**, radiologists, have moved their consulting rooms from 6 West Burger Street to 206 Medfontein, St. Andrew Street, Bloemfontein. Telephone 3610.

**Drs. R. J. Tahan en G. C. Borggreve**, radioloë, het hulle spreekkamers verander van Wes Burgerstraat 6 na Medfontein 206, St. Andrewstraat, Bloemfontein. Telefoon 3610.

*Sintrom*, an anticoagulant of the coumarin type for the prophylaxis and treatment of thrombo-embolic diseases. *Sintrom* is characterized by the following properties: The coagulation valency—percentage prothrombin (Quick)—is rapidly depressed after oral administration, this depression can be held at a constant level by means of a single dose of *Sintrom* a day; ease of control lends safety to therapy; withdrawal of the drug is followed by rapid normalization of the coagulation valency, even after a long period of therapy, there is little tendency to cumulation; the necessary doses are small; the tablets are practically tasteless; toleration (including gastric toleration) is excellent; and the drug is eliminated by excretion, it is not metabolized.

**Tuco (Pty.) Ltd. (South African Subsidiary of The Upjohn Company) (Stand No. 11)**

*Orthoxine* will take pride of place in the exhibit, together with its companion product, *Orthoxicol*, and representatives of the Company will be present to discuss with the medical profession the most recently released drugs emanating from the research department of The Upjohn Company. Products will include newer antibiotics, steroids and hormones.

**I.C.I. South Africa (Pharmaceuticals) Ltd. (Stand No. 9)**

The I.C.I. stand will depict various aspects of the work of their new pharmaceutical research laboratories, and full information on these and the other medical speciality products of I.C.I. will be available from the technical representatives on duty at the stand. Among the more recent discoveries of the I.C.I. Laboratories which will be exhibited will be *Mysoline*, for the treatment of epilepsy; *Hibitane*, a new antibacterial agent for local use; *Fluothane*, a new inhalational anaesthetic; and *Fulcin*, the first oral treatment for fungal infections of the skin.

**Gurr Surgical Instruments (Pty.) Ltd. (Stand No. 30)**

*Bard-Parker Rib-Back Sterile Scalpel Blade* made of superior carbon steel, which has long been proved to be the best for fine cutting edges.

*Skeletons and Bard's* new items such as sterile bedside drainage bags and dual hangers and disposabags and tubes, as well as the *K-Gar* disposable catheter and umbilical clamps.

Other interesting products will also be exhibited and Mr. Roy Freeman and Mr. W. Collins-Gurr will be in attendance at the stand.

**Sandoz Ltd. (Stand No. 36)**

Sandoz Ltd., Basle, Switzerland, have decided to refrain from showing on their stand information relating to any specific product. They are confining their exhibit to showing the emblem of Sandoz and an aerial view of the Sandoz works in Basle from where many leading preparations in their field have emanated. Sandoz hope that the exhibition of the emblem at this show will remind the medical profession of the many useful preparations such as *Calcium Sandoz*, *Cedilanid*, *Gynergen*, *Mesantoin*, *Syntocinon*, etc., which the house of Sandoz has put at their disposal.

**Southern African Cardiac Society, Cape Province Section.** Contrary to the notice published in the *Journal* of 12 September (33, 780) Professor George E. Burch's lecture on 'Clinical aspects of spatial vectorcardiography' will now be held in the Physiology Lecture Theatre, Medical School, Observatory, Cape, at 8.15 p.m. on Thursday 24 September and not in the E-floor lecture theatre, Groote Schuur Hospital. This notice is final. Will members of the Cape Western Branch (M.A.S.A.) please note that the information concerning this meeting published in their *Newsletter* is incorrect.

**Dr. M. Minde**, Physician Superintendent, Komani Hospital, Queenstown, retired on pension on 16 September 1959. He resumed duty as a temporary medical officer at Sterkfontein Hospital Krugersdorp, on 17 September 1959.

**The South African Society of Medical Women (M.A.S.A.).** The Annual General Meeting of this Society will be held in the Carlton Cellar, East London, on 1 October at 2.15 p.m., following the Medical Women's Luncheon at the same venue.

Dr. Walter J. Levy, M.B., B.Ch. (Rand), D.O. (R.C.P. & S.), F.R.C.S. (Eng.), in order to avoid confusion, wishes to draw the attention of his colleagues to the fact that he is still in ophthalmic practice in partnership with Dr. Maurice Franks at 223 Lister Buildings, Johannesburg. Telephone: 22-4522.

Dr. Walter J. Levy, M.B., B.Ch. (Rand), D.O. (R.C.P. & S.), F.R.C.S. (Eng.), om enige misverstand te voorkom, wens sy kollegas se aandag daarop te vestig dat hy nog steeds in venooskapp, as oogarts, met dr. Maurice Franks, by Listergebou 223, Johannesburg, praktiseer. Telefoon: 22-4522.

## NUWE PREPARATE EN TOESTELLE : NEW PREPARATIONS AND APPLIANCES

### WINSTON-GREEN BLOOD PRESSURE FOLLOWER

Winston Electronics Ltd. of Shepperton, Middlesex, England, in introducing the Winston-Green Blood Pressure Follower, supply the following information:

This apparatus will record blood pressure continuously over long periods of time without the need for arterial puncture. It may be used in the routine recording of blood pressure, during and after operations, in drug-response studies on hypertensive patients, in fact in all cases where more than an isolated reading is required. The use of this apparatus shows how unreliable isolated readings may be, since the act of taking the blood pressure using the arm sphygmomanometer elevates the general systemic blood pressure in many subjects.

The arterial pulsation from the digital artery of a finger or toe is picked up on a piezo-electric crystal placed over the artery. This pulsation is employed to open an air-valve on a small pump which inflates a cuff. This cuff occludes the artery proximally to the point of application of the crystal and, when this occlusion is complete, the air-valve is closed and a leak allows the cuff to deflate until pulsations reappear, when further air enters the cuff. The cuff pressure necessary to occlude the digital artery is a few mm. Hg above the digital artery pressure and corresponds very closely, in most subjects, to the systolic brachial artery pressure as recorded by the arm sphygmomanometer.

The cuff has been designed to enclose the entire finger and to raise the pressure of the finger tissues to the level of the blood pressure. In this way the cuff acts as a G-suit on the finger and allows the normal exchange of tissue fluid, nutrition and metabolites to continue with the small blood flow which occurs when the effective cuff pressure is below that of the digital artery pressure. This, coupled with the low metabolism of the finger, permits the cuff to be kept in position for 4 hours or longer without cyanosis or oedema developing. The cuff is quite comfortable and there is no ischaemic pain during use.

An indication of the pressure is given by a dial on the front panel. In addition a sphygmomanometer, which is provided, may be used; a continuous record of the pressure is given on a heat-sensitive chart calibrated from 0 to 300 mm. Hg.

This apparatus is obtainable in South Africa from Westdene Products (Pty.) Ltd., P.O. Box 7710, Johannesburg.

### DEMAZIN

Schering (Pty.) Ltd. announce that the syrup chlortrimeton compound prepared by Schering Corporation USA will now be called Demazin Syrup.

**Description.** Each teaspoonful (5 c.c.) of Demazin syrup contains 1.25 mg. of chlorphenylpyridamine maleate and 2.5 mg. of phenylephrine hydrochloride.

**Indications.** Designed primarily for paediatric use, Demazin syrup is indicated especially for nasal congestion associated with common colds and vasomotor or allergic rhinitis, including hay fever. It is recommended in respiratory conditions involving congested bronchial mucosa and bronchospasm, particularly bronchial asthma, bronchitis, and unproductive cough due to common colds or allergies. Demazin syrup is of value also in allergic conditions such as urticaria, neurodermatitis, poison-ivy dermatitis, allergic eczema and contact dermatitis.

**Advantages.** The complementary antihistaminic-vasoconstrictor action of Demazin syrup provides prompt, prolonged relief from nasal congestion without inducing ephedrine epinephrine-like side-effects. It is particularly suited to the treatment of persistent rhinorrhea in young children, especially those with coexisting adenoidal hypertrophy and allergic rhinitis. Demazin syrup restores free breathing and facilitates drainage of the nasal cavity and sinuses, an action that helps prevent possible infection. The preparation often makes the use of topical nasal instillation unnecessary and eliminates the risk of improperly administered topical agents. Pleasant-tasting, easy-to-give Demazin syrup poses no problem of administration.

**Dosage.** Children under 1 year:  $\frac{1}{2}$  teaspoonful every 3 or 4 hours; 1-3 years:  $\frac{1}{2}$ -1 teaspoonful every 3 or 4 hours; 3-6 years: 1-2 teaspoonfuls every 3 or 4 hours; and adults: 2-4 teaspoonfuls every 3 or 4 hours.

**Packaging.** Demazin syrup is supplied in bottles of 4 oz. and 16 oz.

### CYTOCALDIN

Glaxo Laboratories (S.A.) (Pty.) Ltd. introduce Cytocaldin, a calcium and vitamin B<sub>12</sub> tonic with vitamin D<sub>2</sub>, and supply the following information:

Cytocaldin is a valuable tonic providing calcium in a form that is easily utilized by the body. Its assimilation is assisted by the vitamin D<sub>2</sub>. Cytocaldin also contains vitamin B<sub>12</sub>, of which the tonic value has steadily become established in recent years. It has a pleasant banana flavour.

**Indications.** Cytocaldin is a valuable tonic, not only for young and old, but also in convalescence and during pregnancy or lactation, and for the treatment of asthenic syndromes, some skin diseases, and run-down conditions. As a readily taken syrup with a pleasant flavour, it is an ideal method of increasing calcium in the diet as may be needed to prevent dental caries, or when resistance to illness may become lowered by under-nutrition or adverse seasonal conditions.

**Composition.** One teaspoonful (3.5 c.c.) contains: 15 µg vitamin B<sub>12</sub>, 215 units vitamin D<sub>2</sub>, and 150 mg. calcium phosphate in a banana-flavoured base.

**Dosage.** Infants  $\frac{1}{2}$ -1 teaspoonful, children  $\frac{1}{2}$ -2 teaspoonfuls, adults 2 teaspoonfuls.

**Packing.** Cytocaldin is issued in bottles of 16 fl. oz.

## BOEKE ONTVANG : BOOKS RECEIVED

*Afrikaner-Volkseenheid en my Ervarings op die Pad Daarheen.* Deur D. F. Malan. Pp. 299. 25s. Kaapstad, Bloemfontein, Johannesburg: Nasionale Boekhandel Beperk. 1959.

*'n Swerwer op die Sonpad.* Deur W. A. de Klerk. Pp. 245. Illustrasies. 18s. 6d. Kaapstad, Bloemfontein, Johannesburg: Nasionale Boekhandel Beperk. 1959.

*Berigte te Velde.* 2de druk. Opstelle oor die idee van 'n Afrikaanse nasionale letterkunde. Pp. 69. 15s. Kaapstad, Bloemfontein, Johannesburg: Nasionale Boekhandel Beperk. 1959.

*Sex and the Adolescent.* A guide for young people and their parents. By Maxine Davis. Pp. xxii + 233. 15s. net. London, Melbourne, Toronto: Heinemann. 1959.

*Recent Progress in Microbiology.* Symposia held at the VII International Congress for Microbiology, Stockholm, 1958. Under the auspices of the International Association of Microbiological Societies (IAMS) and the Swedish Microbiological Society. With an addendum (in English and French) on the Structure and Function of IAMS, compiled by C.-G. Hedén, Secr.-Gen. Editor: G. Tenevall. Pp. 453. Illustrations. 70s. Oxford: Blackwell Scientific Publications Ltd. 1959.

*Systemic Lupus Erythematosus.* A Mount Sinai Hospital monograph. Edited by George Baehr, M.D. and Paul Klemperer, M.D. Pp. iv + 84. Illustrations. \$3.75. New York and London: Grune & Stratton, Inc. 1959.

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